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NORMAN-POLK WATERSHED

NORMAN AND POLK COUNTIES, MINNESOTA

FINAL ENVIRONMENTAL IMPACT STATEMENT

HARRY M. MAJOR, STATE CONSERVATIONIST
Soil Conservation Service

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WEST POLK SOIL AND WATER CONSERVATION DISTRICT
107 East Second Street, Crookston, Minnesota 56716

NORMAN COUNTY BOARD OF COMMISSIONERS
Courthouse, Ada, Minnesota 56510

POLK COUNTY BOARD OF COMMISSIONERS
Courthouse, Crookston, Minnesota 56716

WILD RICE WATERSHED DISTRICT
Ada, Minnesota 56510

March 1975

PREPARED BY:

UNITED STATES DEPARTMENT OF AGRICULTURE
Soil Conservation Service
316 North Robert Street
St. Paul, Minnesota 55101

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FINAL ENVIRONMENTAL IMPACT STATEMENT

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USDA ENVIRONMENTAL IMPACT STATEMENT

Norman-Polk Watershed Project

Norman and Polk Counties

Minnesota

Prepared in Accordance with
Sec. 102(2)(c) of Public Law 91-190

SUMMARY SHEET

- I. Final
- II. Soil Conservation Service
- III. Administrative
- IV. A project for watershed protection, flood prevention, and drainage in Norman and Polk Counties, Minnesota, to be implemented under authority of the Watershed Protection and Flood Prevention Act (Public Law 566, 83d Congress, 68 Stat. 666), as amended. The plan includes land treatment and structural measures consisting of 28 miles of channel work and 6 grade stabilization structures.
- V. Summary of environmental impacts including favorable and adverse environmental effects.
 - A. Increase land adequately treated from 20,680 to 49,450 acres.
 - B. Reduce wind erosion from 20 to 4 tons per acre on 12,000 acres.
 - C. Reduce annual wind and water erosion from 1.1 to 0.8 ton per acre.
 - D. Reduce nutrient (N,P,&K) pollution.
 - E. Increase wildlife habitat.
 - F. Increase scenic variety of featureless lake plain by 800 acres.
 - G. Reduce acres flooded on a 5-year frequency flood event from 18,200 to 0 acres.
 - H. Reduce annual flood and streambank erosion damage by 73 percent.
 - I. Reduce land voiding from 0.75 to 0 acre per year.
 - J. Reduce sedimentation outflow from 37,500 to 18,000 tons per year.
 - K. Improve surface drainage on 4,000 acres of cropland.
 - L. Improve maintenance of channels.

- M. Reduce contributing drainage area of judicial ditch 53 system.
- N. Reduce placement of snow in the channel from the snow removal operations on the road.
- O. Reduce operating hazards along channel.
- P. Increase farm income an average of \$1,175 for each of the 85 land users.
- Q. Increase crop production.
- R. Increase employment opportunities.
- S. Reduce temporarily the soil fertility on 55 acres of spoil bank area.
- T. Increase sediment during construction.
- U. Increase peak discharge into Red River.
- V. Reduce or eliminate traffic on five township roads by removal of bridges and culverts.
- W. Removal of 252 acres of cropland from production will reduce net income to land users by \$5,100 annually.
- X. Removal of five acres of forest land.

VI. Alternatives considered:

- A. Land treatment.
- B. Single-purpose flood-prevention structure and channel work.
- C. Diked floodways.
- D. No project.

VII. The following commented on the draft environmental impact statement:

Department of the Army
 Department of Health, Education, and Welfare
 Department of the Interior
 Department of Transportation
 Environmental Protection Agency
 Advisory Council on Historic Preservation
 Governor of Minnesota
 Minnesota Department of Highways
 Minnesota Department of Natural Resources
 Agricultural Extension Service
 Minnesota Historical Society
 Minnesota Association of Soil and Water Conservation
 Districts
 Agassiz Audubon Society

VIII. Draft statement transmitted to CEQ on August 16, 1974.

USDA SOIL CONSERVATION SERVICE
FINAL ENVIRONMENTAL IMPACT STATEMENT^{1/}

for

Norman-Polk Watershed, Minnesota

AUTHORITY

Installation of this project constitutes an administrative action. Federal assistance will be provided under authority of Public Law 83-566, 83d Congress, 68 Stat. 666, as amended.

SPONSORING LOCAL ORGANIZATION

East Agassiz Soil and Water Conservation District
West Polk Soil and Water Conservation District
Norman County Board of Commissioners
Polk County Board of Commissioners
Wild Rice Watershed District

PROJECT PURPOSES

The Sponsors and the Service have three main purposes to achieve in developing and implementing the plan that allows for the proper land use in the interest of soil and water conservation and improves the quality of the environment in the natural resource base. They are: (1) watershed protection, (2) flood prevention, and (3) drainage. The objectives of each purpose are discussed in more detail.

Watershed Protection (Conservation Land Treatment)

The objective is to improve and maintain the land resources through the accelerated application of conservation practices and improved management. The goal is to install a sufficient amount of conservation practices so that 70 percent of the land will be adequately treated at the end of the 6-year project installation period. Protection of these soils is needed to reduce wind and water erosion, as well as improve their fertility for sustained land use.

^{1/} All information, photographs, and data, except as otherwise noted, were collected during watershed planning investigations by the Soil Conservation Service and Forest Service, U.S. Department of Agriculture. (Hereinafter, the Soil Conservation Service is referred to as the Service and the Sponsoring Local Organization is referred to as the Sponsor.) See Glossary of Terms for definitions in Appendix G.

Flood Prevention

The objective is to provide flood prevention from 5-year frequency floods in the watershed. This will be achieved by modifying, enlarging, and increasing the depth of the previously modified channels, and replacing or removing bridges and culverts which have inadequate flow capacities.

This flood prevention objective also includes erosion control. Erosion control will include the installation of necessary grade stabilization structures in the eroding channel reaches and particularly where the channels outlet into the Red River of the North.^{2/}

Drainage

The objective is to correct the prolonged wetness problems on cropland. This cropland contains many small depressions occurring in random patterns. This drainage will be accomplished by providing adequate outlets to remove 0.35 inch of surface water in a 24-hour period.

PLANNED PROJECT

Land Treatment Measures

The soil and water conservation practices will be installed throughout the watershed during the 6-year installation period. Additional land that will be adequately treated includes 26,750 acres of cropland, 1,500 acres of pastureland, 70 acres of forest land, and 450 acres of other land managed for wildlife.

The application of soil and water conservation practices will continue beyond the project installation period.

Land users will also be encouraged through their local soil and water conservation districts to use proper fertilizer and pesticide management.

^{2/} Hereinafter referred to as the Red River.

Some of the conservation practices planned to be applied include:

<u>Land Use</u>	<u>Conservation Practice</u>	<u>Description of Practice</u>
Cropland	Conservation Cropping System	Growing crops in combination with needed cultural and management measures to reduce erosion.
	Crop Residue Management	Using plant residues to protect cultivated fields during critical erosion periods.
	Minimum Tillage	Limiting the number of tillage operations to those that are properly timed and essential to produce a crop and prevent soil damage.
	Field Windbreaks	One or more rows of trees or shrubs established within or adjacent to a field to protect the soil or the growing crop from wind damage.
	Drainage Field Ditches	A graded ditch for collecting and removing excess water within a field.
Forest Land	Tree Planting	Planting tree seedlings or cuttings.
Pastureland	Pasture and Hayland Management	Proper stocking, timely grazing or harvesting, fertilizing to maintain or improve the quality and quantity of forage, to protect the soil, and reduce water loss.
Other	Wildlife Upland Habitat Management	Retaining, creating, or managing wildlife habitat on the upland.

<u>Land Use</u>	<u>Conservation Practice</u>	<u>Description of Practice</u>
Other	Ponds	A water impoundment made by constructing a dam or embankment or by excavating a pit or dugout for pasture and wildlife management.

A combination of two or more practices may be needed to adequately treat the land.

A system of field windbreaks will be installed prior to construction. Windbreaks, at least 110 miles in length (440 acres), will be established adjacent to a minimum of 50 percent of the cultivated fields which are within one mile north and west of the channels and one-half mile south and east of the channels. The windbreaks will be at least 10 rods (165 feet) back from both sides of the channel. Additional conservation practices installed and conservation plans will be required on at least 50 percent of the above described area.

Proper management and appropriate forest land treatment measures will be applied to 70 acres. This will primarily involve the establishment and improvement of tree and shrub cover. Guidance to land users will be provided through the preparation of forest management plans. Technical assistance will be provided by the Minnesota Department of Natural Resources in cooperation with the U.S. Forest Service.

The Sponsors estimate that an additional 60 land users will become cooperators with the soil and water conservation districts. An additional 50 land users are expected to develop conservation plans during the project installation period. Technical assistance will be provided by the Service.

Soil surveys will be prepared on an additional 8,500 acres of land. Technical assistance will be provided by the Service.

Structural Measures

The structural measures planned include 28 miles of channel work, 6 major grade stabilization structures within channels, and numerous grade stabilization structures on side inlets. Channel work includes enlargement of 22.5 miles of previously constructed channels, enlargement of 3.9 miles of existing field ditches, 0.3 mile of new channel work and 1.5 miles of channel stabilization. This channel work is on judicial ditches 52, and 54, lateral 1, systems. There is no planned action on judicial ditches 53 and 54 and county ditch 28. (See Appendix F.)

All channels are designed to carry the 5-year frequency flood within the channel banks. Floods of greater magnitude will continue to flow overland, although they will not flood as large an area or for as long a duration.

The channels will be constructed mostly in massive lake clays but will also pass through fine silty sands and sandy beach ridge deposits.

All channels will be constructed with 4 to 1 side slopes, 15 foot berms, and shaped spoil banks outside the berms.

See figures 1 and 2 for examples of typical cross sections of the channels that are planned.

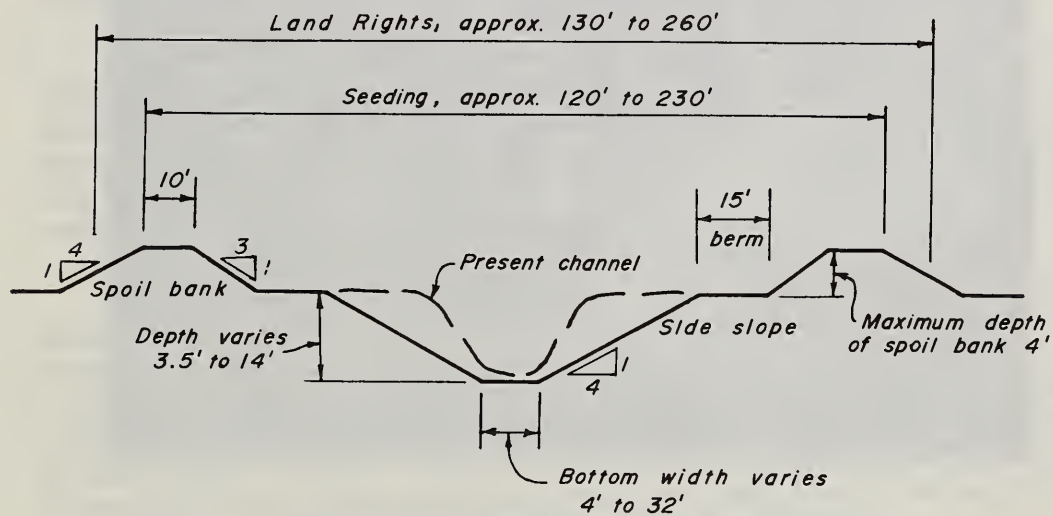


Figure 1. Typical Cross Section of Planned Channel Without Adjacent Road.

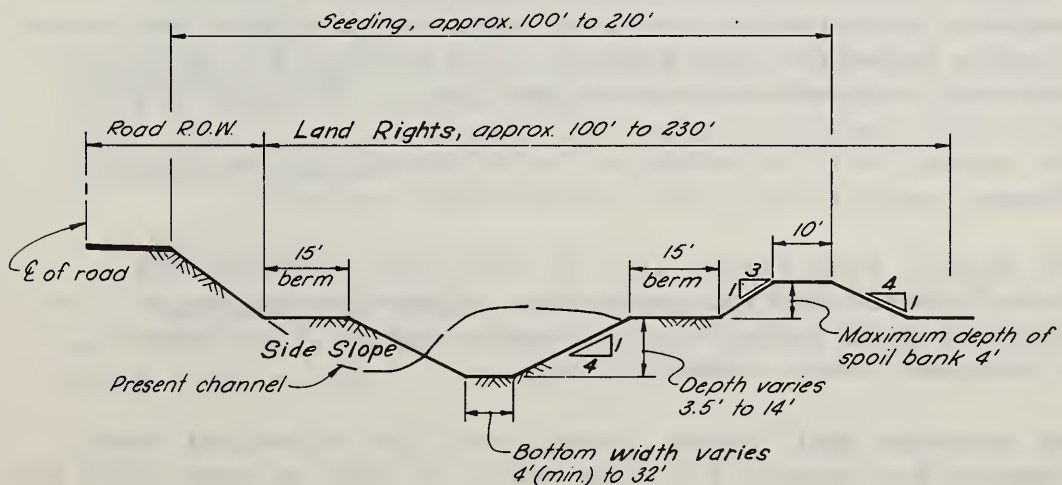


Figure 2. Typical Cross Section of Planned Channel With Adjacent Road

Grade stabilization structures consisting of pipe inlets (approximately 4 to 6 per mile), gated where necessary, will be used to allow surface water to flow into the enlarged channel. Existing laterals which enter a deepened main channel will be excavated near their outlets until a stable grade is provided, or a grade stabilization structure will be installed. (See Figure 3.)



Figure 3. Pipe Inlets.

The channel work will involve reconstruction of 13 bridges and culverts, repair of one bridge, replacement of one bridge with a combination bridge and grade stabilization structure, replacement of one road culvert by a combination culvert and grade stabilization structure, and removal of 10 bridges and culverts. Eleven bridges and culverts are satisfactory. (See Appendix C.)

The channel will be excavated below grade at given points for sediment control during the construction period.

The channel side slopes will be fertilized, seeded, and mulched for erosion control protection. These operations will be performed concurrently during the construction of the channel with an interval not to exceed 15 days.

The unshaped spoil banks, berms, and other disturbed areas, not scheduled for shaping for a period of 30 days or more, will be protected from erosion by broadcast seeding. This will provide temporary cover until the earliest date that final grading and shaping is possible. When these areas are constructed according

to plans and specifications, they will be fertilized, seeded, and mulched within 15 days. The construction of all structural measures in this plan will comply with federal, state, and local regulations concerning air and water pollution.

The establishment period for the structural measures will extend for 3 years from the date the structural measures are accepted as complete from the contractor. This will allow any latent defects or design deficiencies to become apparent. The establishment period for vegetative work associated with a structural measure will terminate when any of the following conditions are met: (1) adequate vegetative cover is obtained, (2) two growing seasons have elapsed after the initial installation of vegetative work, and (3) the establishment period for the associated structural measures has terminated.

During the establishment period for the vegetative measures, the Service may approve Public Law 83-566 cost-sharing for any additional work required to obtain an adequate vegetative cover. Approval of the Service Administrator is required for Public Law 83-566 cost-sharing for other repair or additional work on the completed structural measures.

Provisions of the Act^{3/} relating to the preservation of historical and archeological data will be followed. No known archeological or historical sites will be affected by the project. Should any historical or archeological material be uncovered during construction, the Midwest National Park System Archeological Center and the State Historical Society (State Historic Preservation Officer) will be notified. An appropriate agreement on the steps to be taken will be made.

The channel work is designated as: Main No. 1; Main No. 1, Branch 1; Main No. 1, Branch 2; and Main No. 2. (See Appendix E.)

The channel work, with associated grade stabilization structures, is discussed in more detail in the following paragraphs. Table 1, pages 14 and 15, summarizes the channel sizes, drainage area, land use, land rights, and types of channel work planned for various reaches.

Main No. 1

Approximately 82,100 feet (stations 19 to 840) of channel work will be installed commencing at the Red River along the north side section 1, T. 146 N., R. 49 W., and continuing due

^{3/} Public Law 86-523.

east to the northeast corner section 4, T. 146 N., R. 46 W. (See Appendix E.) The channel will convey the runoff from a 73-square mile drainage area. The shaped spoil bank on the north side of the channel will be one foot or more higher than on the south side.

The lower 2,800 feet of the existing channel flowing in a northwesterly direction will be replaced with 900 feet of new channel. The new channel will flow straight west to the Red River. Between stations 19 and 22 of the new channel, a grade stabilization structure S-1 (a chute spillway) along with 100 feet of structure outlet channel will be constructed to drop the water 35 feet to the normal water level of the Red River. (See Figure 4.) This will require the clearing of 2 acres of forest land and the removal of 1 acre of cropland.

The next 600 feet (stations 22 to 28) of new channel will be constructed in lake clay material. (See Appendix D for plan view.) The channel work will require the removal of 3 acres of cropland.

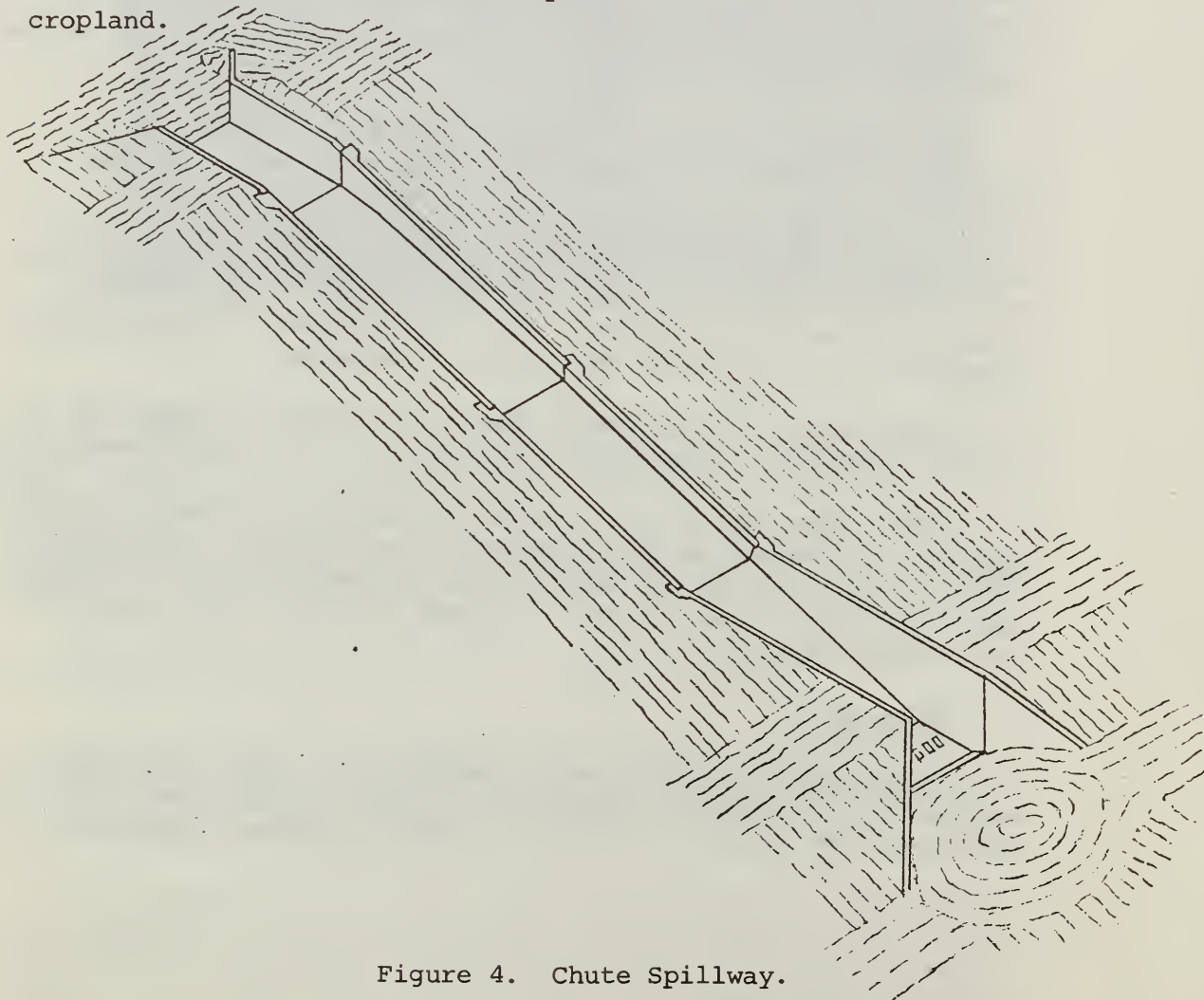


Figure 4. Chute Spillway.

The lower 2,800 feet of judicial ditch 52, portion which flows in a northwesterly direction, will be abandoned and separated from the planned main No. 1. The main No. 1 channel, in the vicinity of the abandoned channel, will be diked to prevent flow from entering the abandoned channel. The dike on the north side of the channel will be 1 foot higher than on the south side. There is no planned action for the abandoned channel.

The next 7,100 feet (stations 28 to 99) of channel work will consist of filling and shaping the existing eroded channel to provide a new stable channel. The fill materials will be obtained from the excavation of the new channel (stations 22 to 28) and grade stabilization structure S-1. Suitable clay material that will withstand the planned velocity of 4.5 feet per second will be used. The channel work will require the removal of 11 acres of cropland in addition to the 18 acres already in the channel area.

At station 50, grade stabilization structure S-1A (box inlet drop spillway) will be installed to drop the water 8 feet to the grade of the reconstructed channel. (See Figure 5.) A bridge will be installed across the box inlet drop spillway to provide for a crossing for the north-south township road.

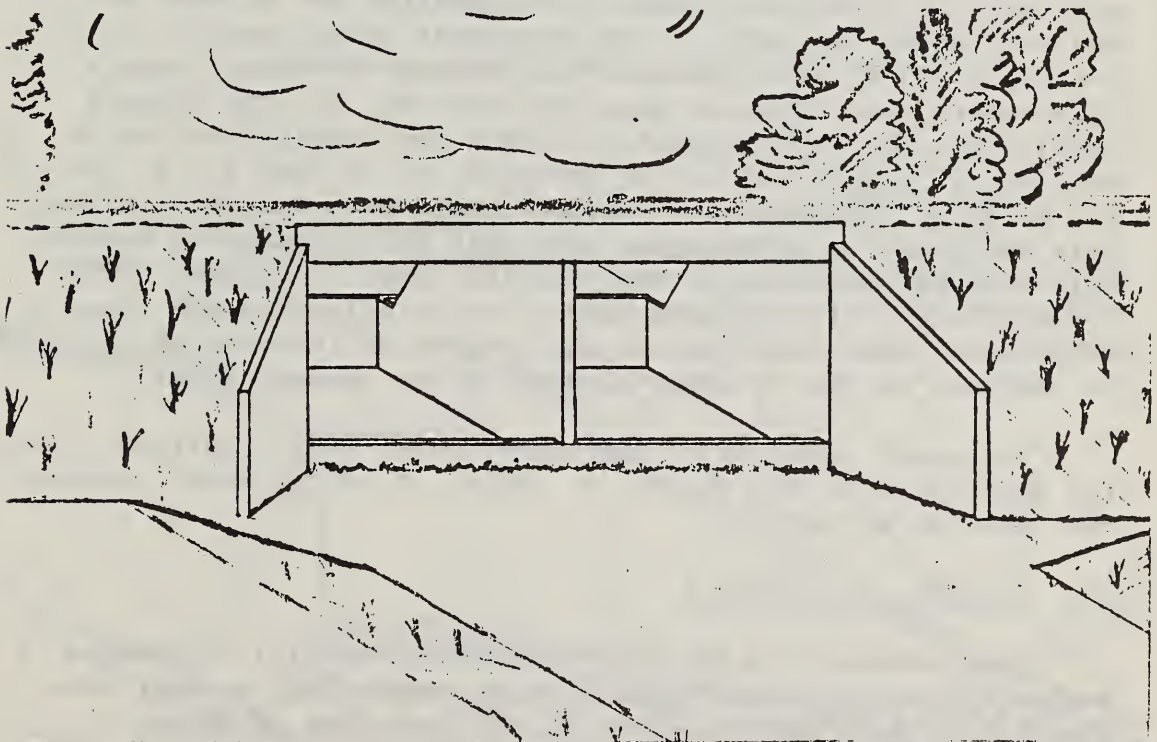


Figure 5. Box Inlet Drop Spillway

The channel from about 20 feet below the Burlington Northern Railroad (station 99) to U.S. Highway No. 75 (station 100) will be riprapped.

At station 100, grade stabilization structure S-1B will have a weir constructed on the upstream apron or a straight drop structure installed immediately upstream of the present twin box culvert at U.S. Highway No. 75. This will drop the water 2 feet. (See Figure 6.) The grade stabilization structure will be designed to have minimal effect on the twin box culvert's capacity.

Riprap will be placed at the foot of the retaining wall which protects the cemetery immediately upstream of U.S. Highway No. 75.

Continuing upstream a distance of 74,000 feet (stations 100 to 840), the channel work will widen and deepen the existing man-made channel. The channel work will require the removal of 125 acres of cropland in addition to the 137 acres already in the channel area.

At station 820, grade stabilization structure S-1C (straight drop spillway) will be installed to drop the water 6 feet. (See Figure 7.)

Main No. 1, Branch 1

Approximately 10,500 feet (stations 0 to 105) of channel work will be installed commencing at station 364 on main No. 1 and continuing due south to the southwest corner section 7, T. 146 N., R. 47 W. This channel will convey the runoff from a 17.5 square mile drainage area into main No. 1. The channel design capacity is increased to handle the runoff from the S $\frac{1}{2}$ sections 17 and 18 and all of sections 19, 20, and 21, T. 146 N., R. 47 W. The existing culverts would be modified to allow this additional area to drain into main No. 1, branch 1 system. This area is presently in the judicial ditch 53 system. The channel work will widen and deepen the existing manmade channel. The channel work will require the removal of 16 acres of cropland, in addition to the 17 acres already in the channel area.

The upper terminus of the channel work is at the road along the north side of section 18, T. 146 N., R. 47 W. which contains the type III wetland.

Main No. 1, Branch 2

Approximately 21,400 feet (stations 0 to 214) of channel work will be installed, commencing at station 682 on main No. 1. The channel work will go south on the east side of County Road 134 and stay east of the Midwest Pipeline. At station 108, the channel work will continue eastward to the northeast corner, section 17, T. 146 N., R. 46 W. (station 214).

The first 9,900 feet (stations 0 to 99) of channel work will widen and deepen the existing field ditch. This will require the removal of 19 acres of cropland in addition to the 11 acres in the field ditch area.

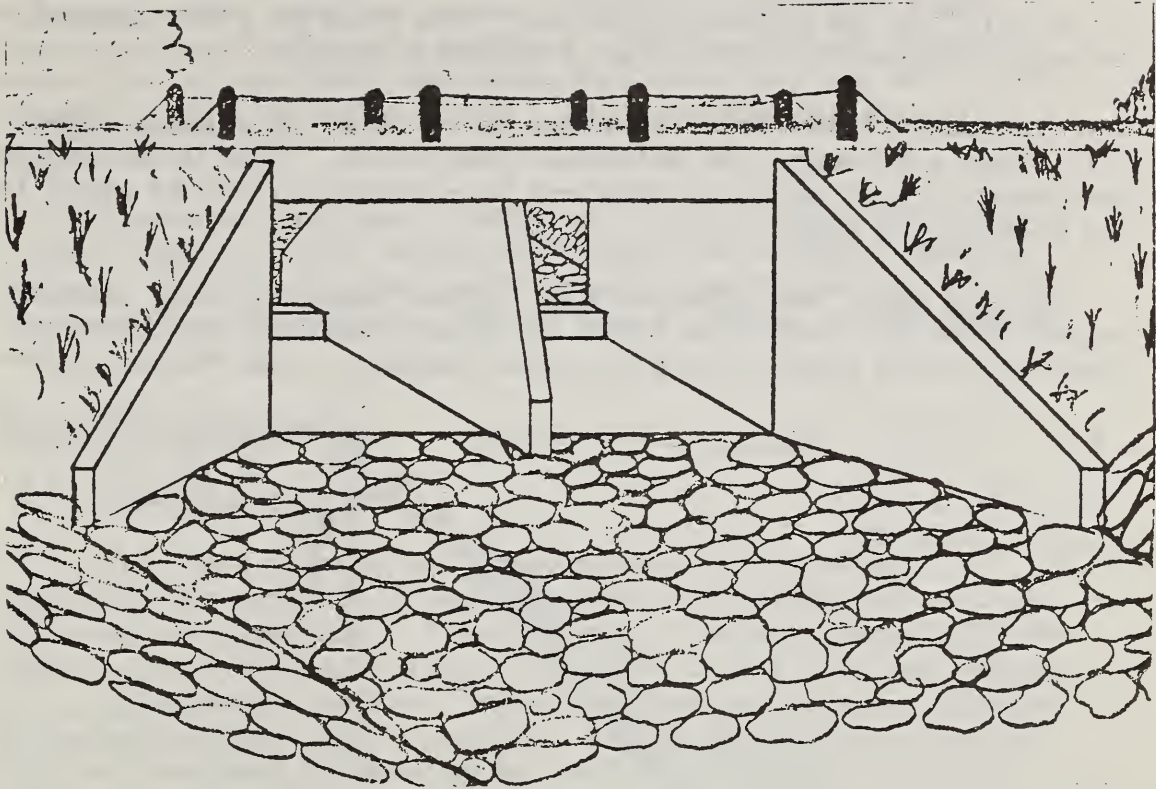


Figure 6. Raised Weir to Box Culvert

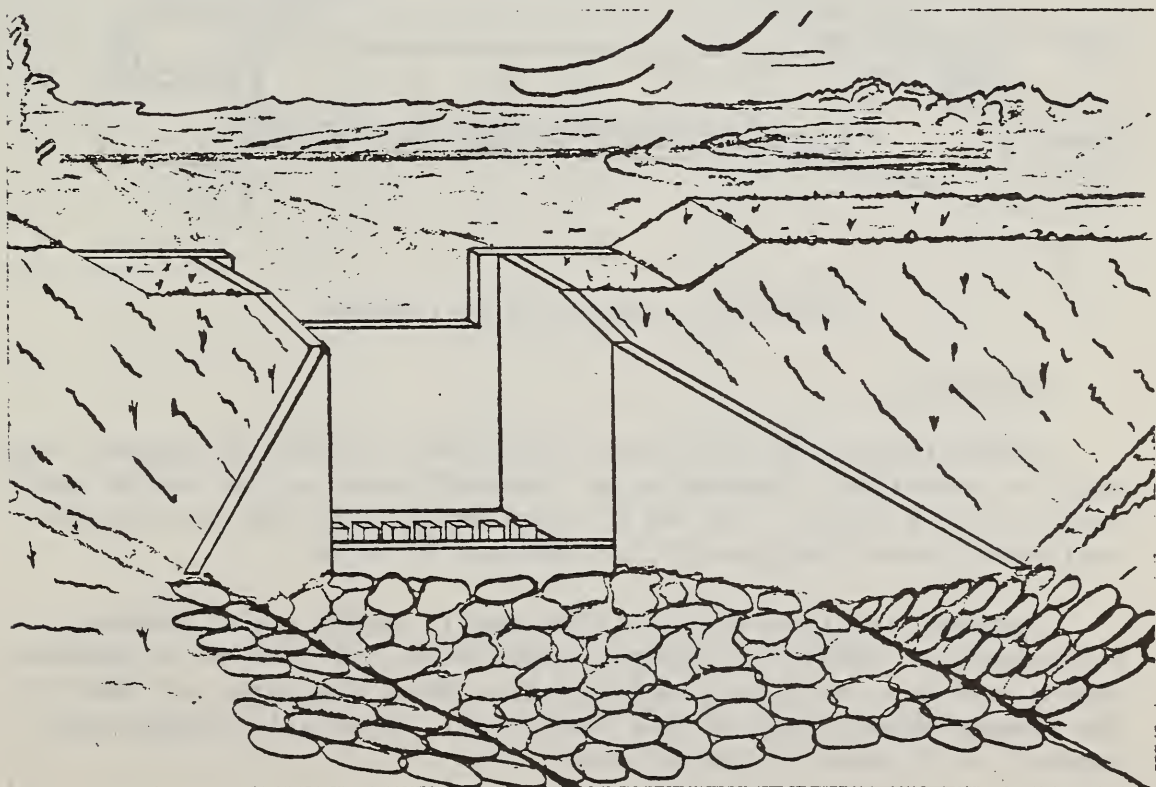


Figure 7. Straight Drop Spillway

The next 900 feet (stations 99 to 108) of channel work will be parallel to the Midwest Pipeline. This will be a new channel and will require the removal of 3 acres of cropland.

The next 10,600 feet (stations 108 to 214) of channel work will widen and deepen the existing field ditch. This will require the removal of 20 acres of cropland in addition to the 13 acres in the field ditch area.

At the upper end (station 214) of the channel, grade stabilization structure S-1D (box inlet to culvert) will be installed to drop the runoff water 6 feet into the channel. (See Figure 8.)

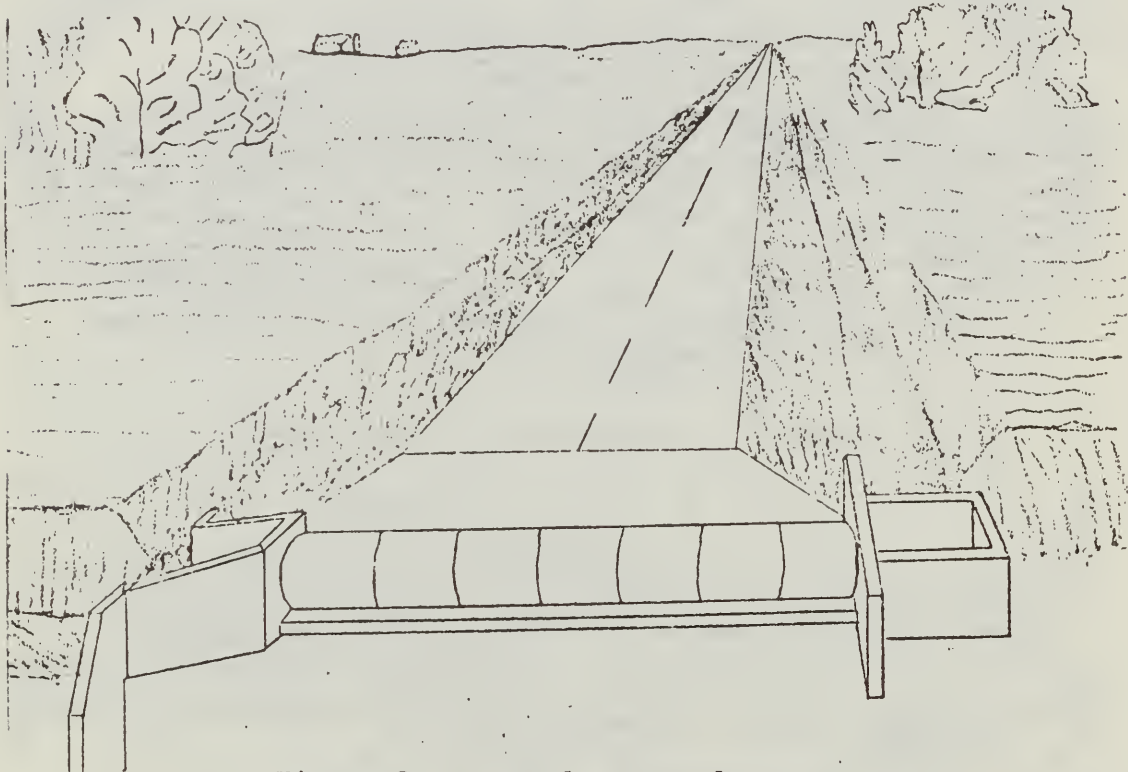


Figure 8. Box Inlet to Culvert.

Main No. 2

Approximately 35,500 feet (stations 0 to 355) of channel work will be installed, commencing at the Red River on the north side section 12, T. 146 N., R. 49 W., and continuing due east to the northeast corner section 12, T. 146 N., R. 48 W.

Between stations 0 and 3 (300 feet), grade stabilization structure S-2 (chute spillway), along with 100 feet of structure outlet channel, will be constructed to drop the water 33 feet to the normal water level of the Red River. This will require the removal of 3 acres of forest land.

The next 400 feet (stations 3 to 7) will consist of filling and shaping the existing eroded condition to provide a new stable channel. The fill material will be obtained from the excavation of the grade stabilization structure S-2 and outlet channel. The land required is 1 acre presently used as the channel area.

Continuing upstream a distance of 34,800 feet (stations 7 to 355), the work will widen and deepen the existing manmade channel. The channel work will require the removal of 54 acres of cropland in addition to the 39 acres already in the channel area.

Nonstructural Measures

Cultural Assessment

A cultural (historic, archeological, architectural) assessment of Norman Polk Watershed will be conducted prior to beginning construction. A contract will be negotiated with the Minnesota Historical Society to conduct this survey and assessment. If affected cultural resources are encountered prior to or during construction, a salvage and/or preservation program will be developed in association with the Sponsors, Service, Minnesota Historical Society (State Historic Preservation Officer), and the U.S. Department of the Interior, National Park Service.

TABLE 1 - PLANNED CHANNEL WORK--Continued

Channel	Station	Drainage Area (Sq. Mi.)	Bottom Width (Feet)	Depth ^{1/} (Feet)	Present Channel (Acres)	Land Use Crop (Acres)	Land Rights ^{2/} (Acres)	Type of Work ^{3/}	Type of Channel ^{4/}	Flow Condition ^{5/}	Road Adjacent to Channel
Main No. 2--	0 to 3	Grade stabilization	structure	S-2	(7)		3	V	M	E	Yes
	3 to 7	4.6	6	2.5	1	-----	1	V	M	E	Yes
	7 to 92	4.7	6	2.5	9	14	25	II	M	E	Yes
	92 to 355	3.1	4	3.0	30	40	76	II	M	E	Yes
Total Main No. 2-----					40	54	105				
Grand Total-----					236	252	546				

1/ Design flow depth

2/ This area (546 acres) is the total land rights required for the construction, operation, and maintenance of the structural measures. The land use is 236 acres of existing channel area, 252 acres of cropland, and 5 acres of forest land. There is an additional 53 acres that will continue to be cropped.

3/ I - Establishment of new channel including necessary stabilization measures.

II - Enlargement of realignment of existing channel or stream.

V - Stabilization as a primary purpose.

4/ M - Man-made ditch or previously modified channel.

O - None or practically no defined channel.

5/ E - Ephemeral - flows only during periods of surface runoff, otherwise dry.

I - Intermittent - continuous flow through some seasons of the year, but little or no flow through other seasons.

6/ There are 2 acres of forest land in addition to the cropland acres in this reach.

7/ There are 3 acres of forest land in this reach.

Operation and Maintenance

The land users are responsible for the operation and maintenance of all conservation practices installed on their land. These practices will be operated and maintained in a manner that will insure their normal life expectancy and maintain allowable soil loss tolerances. Technical assistance is available from the Service through the local soil and water conservation districts.

An operation and maintenance agreement for the structural measures will be executed between the Sponsors and the Service prior to signing a project agreement. The Wild Rice Watershed District will be responsible for financing and implementing the maintenance work. Funds for the maintenance work will be obtained by assessments to the beneficiaries. The maintenance will be performed in a timely, adequate, and appropriate manner to assure efficient operation and functioning of the works of improvement for the 50-year evaluation period of the project. Annual expenses of operation and maintenance are estimated at \$22,150.

Channel maintenance will include periodic cleanouts and control of weeds and other vegetation. Cleanouts include removal of sediment deposits and debris. Weed and vegetation control will be accomplished by mowing and application of chemicals within state and federal regulations. Other channel maintenance may include repairing eroded channel banks, channel bottoms, berms, spoil banks, and repair of surface inlets. Mowing and chemical control will be delayed until after July 15.

The maintenance of the grade stabilization structures may require the repair of earth fills, removal of debris, replacement of riprap, replacement of corrugated metal pipes, and any repair necessary to concrete structures. Operation and maintenance will also include the normal repair of bridges and culverts to maintain a stable channel of design capacity.

The operation and maintenance agreement will include provisions for joint inspections by the Sponsors and a representative of the Service during the first three years after the installation of the structural measures. After the three-year period the Sponsors will make these inspections. Inspections will also be made after unusually severe floods and any other unusual conditions which could adversely affect the structural measures.

The Sponsors will furnish annual inspection reports to the Service.

Project Costs

The total installation cost of the plan is estimated at \$2,287,500 of which \$697,200 is for land treatment and \$1,590,300 is for structural measures.

The cost sharing between Public Law 83-566 funds and other funds is tabulated in the following table:

Table 2 - Estimated Costs

Item	P.L. 566 Costs	Other Costs	Total Costs
Land Treatment-----	\$72,100	\$625,100	\$697,200
Structural Measures:			
Construction-----	1,001,600	53,000	1,054,600
Engineering, Land Rights, and Administration-----	268,200	267,500	535,700
Total Structural Measures--	1,269,800	320,500	1,590,300
Total Installation Cost----	1,341,900	<u>1/</u> 945,600	<u>1/</u> 2,287,500

1/ An additional \$36,200 of non-project costs is provided for a new road crossing and additional structure width for the new bridges. This cost includes construction, engineering, land rights, and administration of the non-project measures.

The benefit cost ratio is 1.4:1. (See Appendix A.)

ENVIRONMENTAL SETTING

Physical Resources

The project is located in northwestern Minnesota in Norman and Polk Counties and has a drainage area of 72,500 acres, or 113.3 square miles. There are 59,000 acres (81 percent) in Norman County and 13,500 acres (19 percent) in Polk County.

The watershed is long and narrow, extending from the Red River to the east for about 22 miles, and has an average width of 5 miles. The major natural watercourses adjacent to the watershed are the Sandhill River on the north and the Marsh River on the south. The watershed itself has no lakes or major natural watercourses. The surface runoff is presently being removed by a series of judicial and county ditches. The watershed is located within the Red River Subregion of the Souris-Red-Rainy

Water Resource Region.^{4/} The water and related land resources in the watershed are similar to the other watersheds in the subregion.

The city of Shelly (pop. 310) is the only incorporated community within the watershed. The watershed population is estimated at 800 people, according to the 1970 census.^{5/} Fargo-Moorhead, the nearest major trading center, is located about 40 miles south of the watershed. The metropolitan area of Minneapolis-St. Paul is located approximately 250 miles southeast.

Soil and water resource characteristics are directly related to the glacial origin of the subregion. In the late stages of the last continental glaciation, about 10,000 years ago, a large inland lake was formed which has been named Glacial Lake Agassiz.^{6/} The lake covered the entire Red River Valley and extended into Canada. The lake began to shrink in size as the melting ice retreated northward. The shrinking lake margins are preserved to this day by the sand and gravel beach shorelines formed at each successive lower lake level. The succession of beach shorelines are presently referred to as beach ridges.^{6/} At least three of these beach ridges occur in this watershed. The beach ridges and near-shore sand areas occupy the eastern one-third of the watershed east of State Highway No. 9. These soils are sandy, droughty, and low in inherent fertility. The beach ridge areas are moderately steep, allowing for rapid runoff.

The deeper portions of the glacial lake bottom, in the lower two-thirds of the watershed, were built up from fine silt and clay sediments derived from the rivers discharging into the lake. The lake clay sediment soils have high fertility levels, are capable of producing a wide variety of agricultural crops, and form the main agricultural resource base of the area. The clay soils have poor internal and surface drainage, and when improperly managed, are subject to wind erosion.

This inner lake bottom is a flat featureless plain that has a gently northwestward slope to the Red River. The flat surface lacks natural watercourses and is presently broken only by road embankments and constructed channels which determine the watershed boundaries. A portion of this lake bottom contains

^{4/} Water Resources Regions and Subregions for the National Assessment of Water and Related Land Resources - Water Resources Council, Washington, D.C., July 1970.

^{5/} Census Data - U.S. Department of Commerce.

^{6/} Nevin M. Fenneman, Physiography of Eastern United States, McGraw-Hill Book Company, Inc., New York and London, 1938.

small depressional areas (micro-relief). (See Figure 9.)



Figure 9. Micro-relief on Flat Land

The Red River, which forms the western boundary of the watershed, has cut a narrow entrenched channel about 35 feet into the lake bottom sediments. The major tributaries to the Red River, such as the Marsh River, have similarly entrenched themselves into the lake bottom. The channel banks along the Red River are considered as stable. This stability is because the soils composing the channel bottoms and banks consists of a lake clay that is erosion resistant. The vegetation along the channel banks consists mainly of trees and associated vegetation.

The channel bottom elevation of the Red River at the outlets of judicial ditches 52 and 54, lateral 1, is approximately 810 feet mean sea level. There is considerable fluctuation in the Red River for various size flows. The 100-year frequency flood elevation on the Red River is 859 feet mean sea level.

The main soil and water resource problem area is located in the lake plain area west of State Highway No. 9. There are approximately 26,000 acres that have floodwater removal problems. There are approximately 2.9 miles of active streambank erosion at the outlets of judicial ditches 52, 53, and 54, lateral 1.

There are 8,000 acres of cropland, which have prolonged wetness conditions, located throughout the watershed.

Nearly 90 percent of the soils are included in land capability classes II and III.

The extreme difference in elevation is about 175 feet with a mean sea level elevation of approximately 1,000 feet on the eastern watershed divide to 825 feet where the watershed empties into the Red River. However, most of this difference in elevation is in the eastern seven miles of the watershed and the escarpment along the entrenched flood plain of the Red and Marsh Rivers.

The area experiences wide seasonal variations in climate. The normal mean monthly temperature varies from 71° F. in July to 6° F. in January. The extreme temperatures recorded are a high of 111° F. and a low of -53° F.^{7/}

The average date of the last frost in the spring is May 23 and the average date of the first frost in the fall is September 20, an average frost-free period of 121 days.^{7/}

The normal annual precipitation is 21 inches, with 14 inches occurring during the growing season from May through September. The normal annual snowfall is 36 inches, which accounts for approximately 3.5 inches of the total precipitation.^{7/}

The mineral resources are limited to small surface sand and gravel deposits located in the beach ridge area in the eastern one-third of the watershed. Ground water resources are generally adequate for farms and cities. The western two-thirds of the watershed experiences the most difficulty in obtaining adequate water supplies since the lake clay deposits yield little water. Some flowing wells exist in the central and eastern portions of the watershed.

There is a 24-inch pipeline running nearly north and south thru the watershed. This line is called the Midwest Pipeline and transports natural gas into the United States from Canada. The pipeline enters the watershed along the north side of section 36, T. 147 N., R. 47 W., and leaves the watershed along the south side of section 30, T. 146 N., R. 46 W.

The land use in the watershed consists of 65,300 acres of cropland (90 percent), 2,200 acres of pastureland (3 percent), 355 acres of forest land (0.5 percent), and 4,645 acres of other land (6.5 percent).

There are 24,100 acres of cropland in the soil and water resource problem area. The remaining 1,900 acres of other land consists of roads, farmstead, and channel areas.

^{7/} Climatological Data for Ada, Minnesota, U.S. Department of Commerce, National Oceanic and Atmospheric Administration, Environmental Data Service.

The major drainageways in the watershed consist of manmade ditches which were constructed about 1915 in the western two-thirds of the watershed. These ditches were installed under the legal ditch procedure of Minnesota Statutes (Chapter 106) and are known as county ditches and/or judicial ditches. These legal ditch systems include judicial ditch 52 and six laterals, judicial ditch 53 and four laterals, judicial ditch 54 and county ditch 3, judicial ditch 54, lateral 1, and county ditch 28. There is a total of 72 miles of existing legal ditches in the watershed. (See map in Appendix F.)

Table 3 tabulates the size of the existing channel on the areas that would be modified by the plan.

Table 3 - Existing Channel Conditions

Channel	Station	Drainage Area (Sq. Mi.)	Bottom Width (Feet)	Depth ^{1/} (Feet)
Main No. 1--	19 to 28	73.3	(2)	(2)
	28 to 50	73.3	<u>3/25</u>	<u>3/14.0</u>
	50 to 99	72.8	<u>3/20</u>	<u>3/14.0</u>
	100 to 364	70.7	18	6.5
	364 to 682	46.7	12	3.5
	682 to 840	21.9	10	4.0
Main No. 1,-	0 to 52	17.5	8	5.5
Branch 1	52 to 105	16.6	8	4.0
Main No. 1,-	0 to 214	17.0	8	1.0
Branch 2				
Main No. 2--	0 to 7	4.6	<u>3/20</u>	<u>3/12.0</u>
	7 to 92	4.6	6	2.0
	92 to 355	3.1	6	3.0

^{1/} Effective depth to remove floodwater from adjacent land. All the side slopes of the channel are approximately 1½ to 1.

^{2/} No channel.

^{3/} Eroded channel.

Drainage adjacent to the legal ditches is accomplished primarily by manmade surface field ditches. The steeper sloping land in the upper one-third of the watershed is drained by small natural channels which outlet into the legal ditch systems or which drain into road ditches connected to these systems.

The flow is ephemeral in all drainageways except for the lower six miles of judicial ditch 52 where the flow is intermittent.

Water quality of the Red River is of the calcium-magnesium, carbonate-bicarbonate type with total dissolved solids in the range of 340 to 700 parts per million. The runoff has a sediment concentration in the range of 275 to nearly 2,000 parts per million.^{8/}

The average annual runoff in the immediate region is 2.2 inches based on stream gage records for the Sandhill River at Climax. The annual runoff has varied from 0.7 to 6.8 inches since the gage was installed in 1943. During March, April, and May, 84 percent of the average annual runoff occurs.^{9/}

There are 14,500 acres of type I wetlands^{10/} and 1,000 acres of type II wetlands in the watershed. The majority (greater than 90 percent) of the types I and II wetlands are presently being used as cropland. There are small acreages of types I and II wetlands in pastureland, and other land.

The type III wetlands are located in the N½ sec. 18, T. 146 N., R. 47 W. These consist of 10 type III wetlands, each less than one acre in size. The land use reverted from cropland to predominately native grasses and forbs approximately 8 years ago when it was placed in cropland adjustment program. It is expected to return to cropland at the end of the contract period.

Present and Projected Population

The population of Norman County has decreased from a high of 14,746 in 1940 to the 1970 population of 10,008. Population projections show a decrease to 8,415 by 1980 and to 5,526 by 2000.^{11/}

Economic Resources

The economy of the area is primarily based on the production and sale of agricultural products. About 80 percent of the cash farm income is from the sale of grain crops. The remaining cash income is from the sale of livestock and livestock products. The average gross income per farm in Norman County in 1969 for all farm products sold was \$18,019.^{12/}

^{8/} Hydrologic Investigations, Atlas HA-61, Department of the Interior, United States Geological Survey.

^{9/} Tables 13 and 14, Souris-Red-Rainy River Basins, Comprehensive Framework Study, Appendix B, Water Resources.

^{10/} Wetlands of the United States, Fish and Wildlife Circular 39, U.S. Department of the Interior, pp. 21 and 22.

^{11/} Population Projections 1975-2000, Minnesota Economic Data, Counties and Regions. Department of Agricultural Economy, University of Minnesota, in Cooperation with State Planning Agency, No. 22, April 1973.

^{12/} 1969 Census of Agriculture, Part 15, Minnesota, Section 2, County Data, p. 425.

There are approximately 220 farm operators who have all or parts of their farms within the watershed. The average size of a farm operation is about 600 acres, ranging from 80 to 2,000 acres. Farms located east of State Highway No. 9 are generally not as intensively farmed due to their sandy soils. The average value of the land in the flood-free portion west of Highway No. 9 is approximately \$300 per acre. Land with flooding and prolonged wetness has an average value of \$250 per acre. Land located east of Highway No. 9 has an average value of \$200 per acre. All land in the watershed is in private ownership.

Principal crops and the average yield per acre for each of the major parts of the watershed are listed in the following table.

Table 4 - Principal Crops Grown and Average Yield

Crop	Unit	Flood-Free and Adequately Drained Area	Soil and Water Resource Problem Area West of	Cropland East of
		West of Hwy. 9	Highway 9	Highway 9
Wheat-----	bu	45	30.0	35
Barley-----	bu	55	35.0	45
Oat-----	bu	75	50.0	60
Sunflower---	cwt	15	10.0	10
Hay-----	tons	4	2.5	3
Soybeans----	bu	20	12.0	16
Corn-----	bu	60	40.0	50
Flax-----	bu	20	10.0	12
Sugar beets-	tons	18	10.0	-----

The accessibility of farmers to the retail communities and market areas is served by U.S. Highway No. 75 along the western side of the watershed and State Highway No. 9 in the eastern portion. There are numerous county and township roads which serve the rural area.

The following statistics apply to social and economic conditions within Norman County (1970 population 10,008). They also apply reasonably well to the conditions within the watershed.

Yearly gross income of families and the percentage of the families in each income bracket are as follows:

<u>Income</u>	<u>Percent</u>
0-\$4,000	29
\$4,000- 8,000	40
8,000-12,000	18
12,000-25,000	12
25,000 and more	1

The average family income is \$6,969.^{13/}

The labor force represents 66 percent of all males 16 years old and over and 28 percent of all females 16 years old and over. Within each group 94 percent are employed and the remaining 6 percent are unemployed. Most of the employment is in agriculture and agriculture-related businesses.

The following table shows the percentage of the total population in each age group and a comparison with the State of Minnesota for 1969.

Table 5 - 1969 Population Percentages by Age Groups
for Norman County and State of Minnesota^{1/}

<u>Age Group</u>	<u>Norman County</u>	<u>State of Minnesota</u>
0-14	27.0	30.8
15-24	12.0	17.0
25-34	8.9	11.7
35-44	9.9	10.6
45-54	11.8	10.5
55-64	12.4	8.7
65+	18.0	10.7
Total	100.0	100.0

^{1/} Minnesota Population, Trends, Estimates, Projections, Minnesota Department of Health, March 1972.

Norman County's population between the ages of 0 and 44 represents a lower percentage of the total population than is true for the State of Minnesota. Conversely, Norman County's population aged 45 years and over represents a larger percentage of the total population than for Minnesota.

Schooling completed by those 25 years old and older is less for Norman County population than for the State of Minnesota, as is shown in the following table.

^{13/} U.S. Bureau of Census of Population; 1970, General, Social and Economic Characteristics, Minnesota, PC(1)-C25.

Table 6 - 1970 Population Percentages by School Years Completed for Norman County and State of Minnesota^{1/}

<u>School Years Completed</u>	<u>Norman County</u>	<u>State of Minnesota</u>
None	0.6	0.7
1- 4	2.9	1.7
5- 7	12.5	6.7
8	31.5	19.4
9-11	13.6	14.0
12	26.2	34.5
13-15	9.8	11.9
16+	<u>2.9</u>	<u>11.1</u>
Total	100.0	100.0

^{1/} U.S. Bureau of Census of Population, 1970, General, Social, and Economic Characteristics, Minnesota, PC(1)-C25.

About 85 family farms, including partnerships located in the watershed, experience economic difficulties due to flood damages.

Plant and Animal Resources

Approximately 90 percent of the watershed (65,300 acres) is cropland, with the majority of this being fall plowed for spring seeding. There are no lakes or perennial streams to support any fisheries.

Year-round wildlife habitat, consisting mostly of perennial vegetation, is generally limited to the road and drainage ditches, type III wetlands, and the forested area. The area is not in the primary range of most game and fish species.

Sharptailed grouse, Northern greater prairie chicken, and pheasants are found in the watershed. Other species include: moose, deer, rabbits, ground squirrels, raccoons, and fox. Sandhill cranes are migrants which seasonally utilize the watershed. The watershed lies in the migratory range of several species listed in the "Threatened Wildlife of the United States", 1973 Edition, USDI, Fish and Wildlife Service. These include: Arctic peregrine falcon, American osprey, Eastern pigeon hawk, and whooping crane. The watershed is located on the extreme eastern edge of the native range of the Western burrowing owl and extreme western edge of the Eastern timber wolf.

Approximately 180 pheasants per hundred miles were counted on roadside surveys in 1963. In 1972 the count was four pheasants per hundred miles.^{14/}

There are no major point sources of pollution in the watershed. The city of Lockhart (unincorporated) is presently using a septic tank system for their municipal waste. There are no farm feedlot operations or industries on the watershed.

Access availability to the existing resource is provided on private land by permission of the landowners.

The vegetation along the existing channel is comprised of a variety of grasses, forbs and grass-like plants. On the lower or bottom parts of the channel and on the wetter soils, the dominant plants are prairie cordgrass and sedges. On the upper slopes, berms and spoil bank the vegetation is a mixture of introduced species such as brome grass, timothy and quackgrass along with some of the native prairie species such as big bluestem, switchgrass, and Indiangrass.

Where recent cleanout or modification has disturbed the vegetative cover, the existing cover consists mainly of the introduced species, such as brome grass, timothy and quackgrass. However, in those areas that have not been disturbed for a long period of time the native species are reestablishing themselves through natural succession. This vegetation provides food cover and nesting areas for the mentioned wildlife, provided the vegetation is not burned or mowed before July 15 of each year.

There are a few remaining areas of native prairie where many of the native grasses and other prairie plants can still be found. A prairie plant community exists along some railroad rights-of-way, road ditches, and fence lines. In its natural state this plant community is dominated by big bluestem, prairie cordgrass, Indiangrass, and switchgrass. Less prominent varieties of grasses include slender wheatgrass, tall dropseed, Canada wildrye, redbud, and bluegrass. Other plants, including prairie-clovers, lead plant, tall gayfeather, and goldenrod, are common.

The forested area is located mainly in the entrenched flood plain of the Red and Marsh Rivers. The primary species consists of elm, oak, ash, cottonwood, and basswood. There are scattered areas of aspen in the upper reaches of the watershed.

Recreation Resources

Outdoor recreational facilities in surrounding areas are limited to municipal parks and playgrounds. There are no

^{14/} Department of Natural Resources, Division of Game and Fish.

developed recreational areas within the watershed. Recreational activity regarding fish and wildlife in the watershed is limited. The watershed has limited water-based recreation due to the lack of lakes and streams.

The people of Norman County recognized the need for developing outdoor recreation facilities and have developed a "County Parks and Recreation Facilities Plan".^{15/} This plan includes the development of a wayside park located along State Highway No. 9 in section 5 of Lockhart Township, 3½ miles north of the city of Lockhart. This facility will require tree planting, a minimum of three picnic tables, potable water supply, and restroom facilities.

A county park is proposed northwest of the city of Shelly at the confluence of the Red and Marsh Rivers. This site of 50 acres will provide for camping, picnicking, and boating.

A proposed Twin Valley Lake Project on the Wild Rice River is located 20 miles southeast of the watershed just outside the city of Twin Valley. The reservoir will have a recreation pool area of 530 acres. The proposed recreational facilities to be developed near the pool will accommodate 24,900 recreation visits annually within three years after the reservoir is completed. Additional recreational facilities may be added as necessary until the year 2020 when the reservoir would accommodate an expected 59,000 recreation visits. Facilities will be provided for boating, fishing, swimming, picnicking, and camping. The proposed recreation facilities will provide a part of the needed water-based recreation.^{16/}

Archeological, Historical, and Unique Scenic Resources

The Minnesota Historical Society was contacted with regard to any known historical sites in the watershed. They responded that there was a mound (site No. 21 PL5) located in the NE¼ sec. 33, T. 147 N., R. 45 W.^{17/} The mound (site No. 21 PL5) will not be affected by the proposed project.

The locally significant Lockhart farm is located near the city of Lockhart, Minnesota.^{18/}

^{15/} County Parks and Recreation Facilities Plan, Norman County, Minnesota, September 1970, pp. 32 and 33.

^{16/} The U.S. Department of the Army, Corps of Engineers, is in the final phase of planning the project.

^{17/} According to Minnesota Historical Society.

^{18/} An appraisal of Potentials for Outdoor Recreational Development, Norman County, Minnesota, East Agassiz Soil and Water Conservation District, August 1970.

The city of Shelly was named in honor of John Shelly who settled along the Red River in 1870.^{19/}

In accordance with the National Historic Preservation Act of 1966 (Public Law 89-665), the National Register of Historic Places was consulted and no places were listed within the watershed.

Soil, Water, and Plant Management Status

The present land use, primarily agricultural uses, is expected to continue. The general trend is toward larger farming units and a cash grain enterprise.

The cooperators of the East Agassiz and West Polk Soil and Water Conservation Districts have followed an active program of planning and applying needed land treatment measures. There are 97 district cooperators who have all or part of their farms in the watershed. This represents 50 percent of the watershed acreage. Soil and water conservation plans have been developed on 85 farms covering about 40 percent of the watershed.

In 1958, the Soil Conservation Service, through the East Agassiz Soil and Water Conservation District, provided plans and specifications for a grade stabilization structure at the outlet of judicial ditch 54. This structure was constructed with financial assistance from an Agricultural Stabilization Conservation Service pooling agreement with landowners.

The status of land treatment is summarized as follows:

<u>Land Use</u>	<u>Adequately Treated (Acres)</u>	<u>Inadequately Treated (Acres)</u>
Cropland-----	19,400	45,900
Pastureland-----	600	1,600
Forest land-----	180	175
Other land (Managed for Wildlife)-----	500	500

The practices applied on these lands include conservation cropping systems, crop residue management, field windbreaks, minimum tillage, drainage field ditches, pasture and hayland management, and wildlife upland habitat management. The remaining 3,645 acres of other land consist of farmsteads, channels, roads, the city of Shelly, and the city of Lockhart.

^{19/} See footnote 18, page 27.

Adequate forest fire protection is provided by the local fire departments and the Minnesota Department of Natural Resources, Division of Lands and Forestry, in cooperation with the U.S. Forest Service through the Clarke McNary Cooperative Forest Fire Control Program. Other current federal-state cooperative forestry programs include: Cooperative Forest Management, Cooperative Forestation, and Cooperative Forest Pest Management.

Projects of Other Agencies

Judicial ditch 54 and county ditch 3 along with county ditch 28, are being improved by local interests under State Statutes, Chapter 106. The hearings are being conducted by the Norman County Board of Commissioners. All costs of this improvement will be paid by assessment to the beneficiaries of the project.

WATER AND RELATED LAND RESOURCE PROBLEMS

Land and Water Management

Approximately 70 percent (45,900 acres) of the cropland is presently inadequately treated. Wind erosion is a hazard throughout most of the watershed, especially in late fall and early spring. The lighter-textured soils in the eastern part of the watershed are especially susceptible to wind erosion. Lack of vegetative cover and roughness of the land surface is responsible for the wind erosion hazard in the lake plain area when flooding or wetness prevent normal crop production. The average annual soil loss from wind and water erosion is approximately 1.1 tons per acre.

Most of the damage occurs from the deposition of sediment in drainage field ditches and road ditches which are a part of the drainage network. This sediment and plant nutrients (N,P, & K) are the major source of pollutants in the runoff water. Damage to a lesser degree also occurs in the form of damage to crops and air pollution.

Many of the outlets of drainage field ditches are eroding and contributing to the sediment deposition in ditch mains and laterals.

The efficient practice of rotating intensively-grown crops, such as sugar beets and small grains, is hindered by the flooding conditions. The land users are forced to fallow more frequently than on the flood-free fields. The fallow conditions contribute to a greater wind erosion hazard.

Approximately 70 acres of forest land are inadequately stocked or are in poor condition. This is due to dead, diseased, or over mature trees.

Floodwater Damages

Frequent flooding of cropland in the major problem area (26,000 acres) is located in the western two-thirds of the watershed adjacent to the judicial ditch systems. The existing channels and bridges have limited capacities resulting in the floodwaters covering a large area due to the lake plain surface. (See Figure 10.) Runoff from the steeper sloping land in the upper one-third of the watershed contributes to the flooding on the lake plain.



Figure 10. Typical Flooding on Lake Plain.

Damage from runoff (snowmelt and rain) often occurs during the same year. Floods from snowmelt runoff cause a delay in seeding crops. Any delay beyond normal seeding date of crops results in a reduction of yields.

Floods from summer storms cause damage to growing crops. Sugar beets are especially sensitive to prolonged flooding. Other crops are also damaged from short periods of inundation, resulting in lower yields and poorer quality. Floods during the harvest season can result in total crop losses.

Other agricultural damage associated with flooding occurs in the flooded area. These damages include the loss of stored grain, expenses involved in moving livestock and hauling feed to them, deterioration of machinery and buildings subject to floodwaters, costs for debris removal, and costs for pumping

water from basements. Another common damage is the infestation of weed seeds by the floodwaters. Additional expenses are incurred by the land users to control the growth of weeds.

Indirect damages resulting from floodwaters include loss of production time, extra travel, and delays in conducting business. A flood causes an interruption in the farming activities resulting in an inefficient operation. Flooded roads require the traffic to detour and travel greater distances. Business transactions are often delayed and interrupted, resulting in a less efficient operation.

Judicial Ditches 52 and 54, Lateral 1

The area flooded by a 100-year frequency flood is 18,400 acres within the watershed. The majority of the flooded area is on the south side of judicial ditch 52 from State Highway No. 9 west to the River. There are several areas where entire sections of land are flooded. In addition, there are 1,600 acres of land flooded adjacent to judicial ditch 52 on the outside of the watershed boundaries. The land use, on the 20,000 acres subject to flooding, includes 18,700 acres of cropland and 1,300 acres of other land. The other land use consists of roads, farmsteads, and channel areas.

The area flooded by the runoff of a 5-year frequency flood is 18,200 acres.

Flooding on the lake plain area occurs on an average of once every year because of the limited capacities of the channels and bridges. There are 12 bridges and 8,400 feet of road that receive damage from floodwaters on these judicial ditch systems.

There are 85 landowners in the problem area.

Judicial Ditch 53

The area flooded by a 100-year frequency flood is 6,000 acres. The flooded area is adjacent to the ditch main starting at State Highway No. 9 and continuing west to the Marsh River. The land use on the 6,000 acres subject to flooding includes 5,400 acres of cropland and 600 acres of other land. The other land use consists of roads, farmsteads, and channel areas.

The area flooded by the runoff of a 5-year frequency flood is 5,000 acres.

Flooding on the lake plain area occurs on an average of once every two years. There are 12 bridges that receive damages from floodwaters on this judicial ditch system.

There are 15 landowners in the problem area.

Recent Flood

The 1969 snowmelt flood was one of the more recent floods to occur in the watershed. Peak runoff from the melting snow occurred around April 9 in the eastern part of the watershed. The coarse-textured soils warmed up quicker and caused thawing of the snow and ice several days earlier than that located on the flatter, finer-textured soils in the western two-thirds of the watershed. As a result, meltwaters from the more sloping part of the watershed approached the flatter portion and quickly spilled out of the main channels onto the cropland.

Considerable snow and ice still remained within the channel in the flatter portion of the watershed, thereby further reducing the present limited channel capacity. In some areas, nearby trees shaded the channel area delaying the melting process. Channels located near the roads were packed with snow and ice from the snowplowing operations during the winter. These channels were also slow to thaw out. In many cases, road culverts and bridges were filled with snow and ice, plugging the channel.

Runoff water continued to flood on the cropland until either enough head was built up clearing the plugged road culvert or bridge or until the water flooded the road. Usually the complete section was flooded by this time. The process repeated itself on each section as the floodwaters moved downstream. Peak flood conditions occurred on April 11 in the central part of the watershed and on April 14 in the western part of the watershed. The Red River, at the outlet of the watershed, peaked on April 20. Total area inundated within the lake plain of judicial ditches 52 and 54, lateral 1, approximated 14,275 acres. There were 3,400 acres flooded on the judicial ditch 53 system. Farm operations were delayed up to 2 weeks as a result of the flood conditions in the flatter areas of the watershed west of Highway No. 9. Yield reduction ranged up to 20 percent as a result of the delayed seeding.

The floodwaters have very little effect, if any, on the health and lives of the people in the watershed.

Erosion Damage

Wind and water erosion is a problem in the watershed. This erosion has only a limited effect on the soil for sustained cropland production.

Wind Erosion

The potential exists for sufficient wind to occur which could result in excessive soil loss. A single occurrence on a small area of land may have an insignificant effect on the land damage. However, these occurrences may cause damage to the drainage networks and other works of improvement. It is common to observe a soil loss from wind in excess of 20 tons per acre from a single field during a particularly severe occurrence. Such an event may occur only once in 20 years on a particular field. A soil loss of only one ton per acre, if adjacent to a drainageway, may totally block that section of the system. (See Figure 11.)



Figure 11. Wind Erosion

Water Erosion

The water erosion problems occur where the field ditches empty into drainage mains and laterals. The erosion is not severe but the resulting sediment deposition in the mains and laterals does cause maintenance problems.

The annual gross erosion rate from wind and water is estimated at 1.1 tons per acre, or 80,000 tons for the watershed. The airborne dust portion of the erosion has not been accounted for in the erosion rates.

Streambank Erosion

The county and judicial ditch systems, constructed mainly before World War I, cut diagonally across the natural drainage pattern. As a result, the constructed ditches were outletted directly over the steep bank of the Red River. Attempts were made to control the large drop (approximately 30 feet) from the lake plain surface to the Red River flood plain with concrete and steel sheet pile structures. These structures were installed on judicial ditches 52, 53, and 54, lateral 1.

These structures have washed out and the channels are cutting headward, deepening and widening from their junctions, with the flood plain of the Red River and, in the case of judicial ditch 53, the Marsh River. A total of 2.9 miles (15,300 feet) of channels are undergoing active erosion. Massive bank sloughing occurs periodically on both banks along the actively eroding channels. (See Figure 12.)



Figure 12. Streambank Erosion

Judicial ditch 52 has active erosion on the lower 11,000 feet of channel. Two sheet pile drop structures have failed and the streambank erosion is continuing. There are approximately 14,000 tons of soil being eroded away annually from the channel bank and bottom. Land voiding amounts to approximately 0.7 acre per year. The streambank erosion has destroyed one township bridge, endangered a cemetery, and is threatening to undermine bridges on the Burlington Northern Railroad and U.S. Highway No. 75.

Judicial ditch 54, lateral 1, has active erosion on the lower 800 feet of the channel. A reinforced concrete drop structure at the outlet has failed and the streambank erosion is continuing uncontrolled. There are approximately 1,000 tons of soil being eroded away annually from the channel banks and bottom. Land voiding amounts to approximately 0.05 acre per year.

Judicial ditch 53 has active erosion on the lower 3,500 feet of the channel. The three sheet pile drop structures have failed and the channel erosion is continuing. There are approximately 4,500 tons of soil being eroded away annually from the channel bank and bottom. Land voiding amounts to approximately 0.25 acre per year.

Damages to bridges, culverts, roads, side inlets, telephone and electrical lines, and land voiding are a result of the streambank erosion.

Sediment Damage

Road ditches and channels are undergoing sedimentation due to wind and water erosion from adjacent fields and field outlet ditches. (See Figure 13.) The damage is reflected in road ditch maintenance and channel cleanout costs which are absorbed by the county taxpayers for the roads and by farmers in the



Figure 13. Sediment Deposition in Road Ditch

legal ditch systems. The streambank erosion, at the outlet of the main ditch systems, is contributing to the total sediment delivered to the Red River.

The sediment yield from wind and water erosion is estimated at 18,000 tons per year. The sediment yield from streambank erosion is estimated at 19,500 tons per year. The annual sediment yield to the Red River from the watershed amounts to 37,500 tons, or an annual yield of 0.52 ton per acre. On this basis, the average annual sediment concentration in the annual runoff waters amounts to 2,050 parts per million from Norman-Polk Watershed.

Drainage Problems

Small depressional areas (8,000 acres) with a prolonged wetness condition from precipitation and storm runoff are located throughout the watershed. They are more numerous in the micro-relief topography in Good Hope Township and the eastern portion of Shelly Township.

The irregular pattern of wet and dry areas in the micro-relief topography make it impractical to operate farm machinery until a field has reached proper soil moisture conditions. Thus, damages occur not only in the depressional areas, but also in the adjacent areas. Damages sustained from prolonged wetness are mainly reduced crop yield, lower quality crops, and higher production costs. During wet years, monetary losses are substantial due to the inability of timely land preparation, planting, cultivation, and harvesting.

There are 4,000 acres of small depressional areas with a prolonged wetness condition located in the major problem area of judicial ditches 52 and 54, lateral 1, system. This area has inadequate outlets for the depressional areas.

There are 1,200 acres of depressional areas with prolonged wetness on judicial ditch 53 system problem area. The remaining 2,800 acres of depressional areas are located in scattered areas through the remainder of the watershed.

Plant and Animal Problems

Past land use, which was primarily native prairie, wetlands, and some forest land, has changed primarily to cropland. This trend has reduced the quantity and quality of habitat for wildlife.

Economic and Social Problems

The watershed is designated as an economically depressed area with lower incomes, higher unemployment rates, less school years completed, and a higher percentage of older people characterizing the area.^{20/}

The median earnings in 1969 for all males 16 years old and over in the labor force was \$4,870. For all females 16 years old and older in the labor force the median earnings was \$2,042. This was considerably less than the median for Minnesota which was \$7,730 and \$3,175 respectively. Twenty-nine percent of the rural farm families earned less than \$4,000 gross income. A similar percentage also existed for the incomes of rural non-farm families.^{21/}

Full time farm operators who sold farm products valued at less than \$5,000 accounted for 26 percent of the total farm operations. Twelve percent of the farm operators sold farm products valued at less than \$2,500.^{22/}

Six percent of the rural labor force was unemployed in 1970.^{21/}

Only 11 percent of all farm operators used 1½ man-years or more of hired labor.^{22/}

Although the above statistics apply to Norman County, they describe reasonably well the actual conditions in the watershed. A need exists for rural community development. More employment opportunities are needed in order to increase incomes and keep the younger members of the population within the community.

Hazards exist in operating farm machinery along the vertical sideslopes of the eroded portions of judicial ditch 52, judicial ditch 53, and judicial ditch 54, lateral 1.

RELATIONSHIP TO LAND USE PLANS, POLICIES, AND CONTROLS

There are no known land use plans, policies, or controls that would conform or conflict with the proposed action.

^{20/} Public Works and Economic Development Act of 1965, Area Redevelopment Administration, U.S. Department of Economic Development.

^{21/} See Footnote 13 on p. 24.

^{22/} 1969 Census of Agriculture, Part 15, Minnesota Section 2, County Data.

ENVIRONMENTAL IMPACT

Conservation Land Treatment

The application of soil and water conservation practices will increase the amount of land adequately treated. The increase in land adequately treated would be as follows:

Land Use	Land Adequately Treated Without Project (Acres)	Land Adequately Treated With Project (Acres)
Cropland-----	19,400	46,150
Pastureland-----	600	2,100
Forest land-----	180	250
Other land (used primarily for wildlife)-----	500	950

This will increase the land adequately treated from 20,680 to 49,450 acres or 68 percent of the watershed.

Along the area where the field windbreaks are installed, the maximum soil loss will not exceed 4 tons per acre in any given year. This will reduce the potential wind erosion from 20 to 4 tons per acre on 12,000 acres.

The wind and water erosion will be reduced with the application of conservation practices. These practices will reduce the average annual erosion from 1.1 to 0.8 ton per acre.

The major source of plant nutrient pollutants (N,P,&K) is by soil erosion. Soil transported by wind or water erosion into the drainage system carries with it these nutrients.^{23/} With soil erosion being reduced by the application of conservation practices, the nutrients will therefore be reduced in a similar proportion.

The land treatment measures will reduce the sedimentation from wind and water erosion. This sedimentation outflow will be reduced from 18,000 to 13,500 tons per year, a reduction of 4,500 tons per year.

^{23/} Location Annual Report, Sections I and II, Morris, Minnesota, U.S. Department of Agriculture, Agricultural Research Service, 1971.

This additional adequately treated land will improve wildlife habitat. Such practices as minimum tillage, conservation cropping systems, crop residue management, and tree planting will increase available food and cover. The system of field windbreaks (at least 110 miles) will reduce wind velocity throughout the area, while providing travel lanes, escape cover, and other types of habitat for most wildlife species.

The application of many land treatment practices, such as field windbreaks, tree planting, farm ponds, and wetland wildlife area development, will provide 800 acres of additional scenic area to add variety to featureless lake plain area.

Structural Measures

The planned structural measure is limited to the judicial ditches 52 and 54, lateral 1, system. No structural measures are planned on the judicial ditch 53 system.

Flooding is presently occurring on the average of once every year. With the structural measures, the frequency of flooding will be less than once every 5 years.

The area flooded from a 5-year frequency flood will be reduced from 18,200 to 0 acres.

The flood damages on 18,700 acres of crops will be reduced by 68 percent.

Other agricultural damages directly related to flooding will be reduced 85 percent. These benefits include reduction of damages to buildings, machinery, and grain storage, as well as reduced cost for debris removal and weed control.

The road and bridge damage due to flooding will be reduced by 56 percent on 12 bridges and 8,400 feet of road.

A stable channel will replace 11,800 feet of active eroding channel near the outlets. The land voiding will be reduced from 0.7 to 0 acre per year on judicial ditch 52 and 0.05 to 0 acre per year on judicial ditch 54, lateral 1, by preventing the occurrence of bank sloughing. The annual soil loss on judicial ditch 52 will be reduced from 14,000 to 0 tons and on judicial ditch 54, lateral 1, will be reduced from 1,000 to 0 tons. The stable channel will also safeguard a U.S. highway, railroad bridge, telephone cable, electric lines, 2 township roads, and a cemetery revetment recently installed. Soil erosion and sedimentation will be controlled along the channel with the installation of the pipe inlets.

The structural measures will reduce the average annual sediment load delivered to the Red River from 19,500 to 4,500 tons. The land treatment and structural measures combined will reduce the sediment delivered to the Red River from 37,500 to 18,000 tons per year, or 0.52 to 0.25 ton per acre per year. This will reduce the turbidity of the Red River at this point and will improve the water quality for downstream users.

The indirect damages from flooding will be reduced by about 71 percent. These benefits will reduce the loss of production time, decrease extra travel, and reduce the delays of conducting business.

The structural measures will reduce the present flood and erosion damages by 71 percent on 20,000 acres, affecting 85 farm units located adjacent to mains No. 1 and 2. The total damage reduction is 73 percent, which includes the damage reduction from the land treatment measures.

Four thousand acres of cropland, presently subject to prolonged wetness conditions, will be provided with improved drainage outlets provided by the installation of mains No. 1 and 2. Drainage of these cropland areas will allow earlier planting of crops, more latitude in the choice of crops grown, and more efficient farming operations.

With improvement in drainage and reduction of floodwaters on the land affected by the channel work, the land will be more intensively cropped and greater quantities of plant nutrients (N,P,&K) will be applied. As a result, the reduced sediment volume entering the drainage system will carry with it a slightly higher concentration of plant nutrients (N,P,&K) per ton of sediment. However, due to the application of land treatment, improved drainage, and reduced floodwaters, the vegetative cover will be improved and the organic matter in the soil will be increased. The added nutrients will be more readily utilized in plant growth. The improved plant growth will provide needed residue to reduce erosion, sedimentation, and nutrient pollution in the drainage system. This all results in a reduction of total nutrients delivered to the Red River since the sediment is reduced by 19,500 tons per year.

Spoil material will be spread over approximately 55 acres that will remain in cropland. This spoil material will have a low level of fertility and poor tilth resulting in reduction of crop yields. Through repeated fertilization and crop residue incorporation, yields will gradually increase, so that at the end of a 5-year period, crop production will be nearly comparable to adjacent cropland.

The vegetative plantings (450 acres), along the channel side slopes, berms, and spoil banks, will provide travel lanes, escape cover, food, and other types of habitat for wildlife species.

Excavation of channels will destroy the existing vegetation which will disrupt upland game and other wildlife habitat in the area until new vegetation is established. Some wildlife will be destroyed by construction equipment.

Should a runoff-producing storm occur immediately after construction, before mulching is completed, the channels will be subject to erosion. This would also cause increased amounts of sediment to be delivered to the Red River. The installation of the grade control structures and the filling of two eroded outlet channels will eliminate the sediment derived from bank erosion. This will more than compensate for the sediment that may be generated by channel construction. The net effect of construction activity on sediment outflow from the watershed will be a reduction.

The maintenance of the structural measures will keep the project performing as designed throughout the 50-year evaluated life of the project. This maintenance will be performed in a manner that will control the erosion and sedimentation.

The enlargement and improved hydraulic efficiency of mains No. 1 and 2 will increase the discharge to the Red River. The present effective channel capacity immediately upstream of eroding reach on main No. 1 is 230 cubic feet per second and the improved flood-free discharge will be increased to 680 cubic feet per second.

The drainage area of the Red River at the confluence of mains No. 1 and 2 is approximately 23,300 square miles, compared to 78 square miles in the watershed. The 5-year frequency discharge on the Red River is estimated at 18,500 cubic feet per second. The maximum increase in discharge on the Red River would be from 18,500 to 18,950 cubic feet per second. However, this amount of increase would only occur when the two peak discharges meet at the same time. During the majority of times the change of peak discharge is insignificant since the watershed discharge would precede the peak discharge of the Red River.

The design of main No. 1 will include four sections of land from judicial ditch 53 system. This, in turn, will have a net reduction of four sections of land in the existing judicial ditch 53 system, thereby reducing the floodwater volumes in the lower reaches.

The snow removed from the roadways during the winter months by the snow removal equipment will be on the berms of the channels and not in the channel. However, there can be windblown snow deposited in the channel. The reduction of snowpack from the roadways in the main channels will allow them to open up earlier in the spring. This will allow the runoff from snowmelt from the fields to be removed in a more timely manner.

The land use changes expected to occur are summarized in the following table:

Table 7 - Expected Changes in Land Use with Installation of Project - Acres

<u>Item</u>	<u>Cropland</u>	<u>Pasture</u>	<u>Forest</u>	<u>Other</u>	<u>Total</u>
Without Project-	65,300	2,200	355	4,645	72,500
With Project----	65,048	2,200	350	4,902	72,500
Change-----	-252	-----	-5	+257	-----

The removal of vertical side slopes in the eroded portions of judicial ditch 52 and judicial ditch 54, lateral 1, with berms and spoil banks will reduce the existing hazard of operating farm machinery along these side slopes.

Increased crop production, expected to occur on the average annual acre basis in the benefited area (11,700 acres), is summarized in the following tables:

Table 8 - Estimated Projected Crop Yields Per Average Annual Acre in Benefited Area

<u>Crop</u>	<u>Unit</u>	<u>Without Project Yields</u>	<u>With Project Yields</u>
Wheat-----	bu	30.0	40.0
Barley-----	bu	35.0	50.0
Oats-----	bu	50.0	70.0
Flax-----	bu	10.0	17.0
Corn-----	bu	40.0	55.0
Soybeans----	bu	12.0	18.0
Sunflower---	cwt	10.0	13.5
Sugar beets-	tons	10.0	16.0
Hay-----	tons	2.5	3.5

Table 9 - Estimated Annual Increase in Projected
Crop Yields in Benefited Area

<u>Crop</u>	<u>Unit</u>	<u>Increased Production</u>
Wheat-----	bu	26,000
Barley-----	bu	35,000
Oats-----	bu	32,500
Flax-----	bu	2,500
Corn-----	bu	5,000
Soybeans----	bu	3,500
Sunflower---	cwt	4,000
Sugar beets-	tons	700
Hay-----	tons	700

Economic and Social

Greater efficiency in agricultural commodity production will occur as a result of reduced flood damages and improved drainage conditions. Fields can be seeded earlier and in larger units. Replanting will be reduced. The use of larger machinery, made possible by more uniform field conditions, will also aid in achieving greater efficiency in food production. Incomes and standards of living will improve.

The annual reduction of crop, other agricultural, gully erosion, and indirect damages, as well as the more intensive land use and drainage benefits, will increase farm income approximately \$100,000 for 85 land users or an average of \$1,175 each. The additional benefit of \$1,175 for each land user will increase the value of farm products sold, improve the economic base, increase per capita income, and provide the basis for further rural area development. These items will be further improved by the annual reduction of flood and gully damages to roads and bridges and indirect damages. This benefit will approximate \$14,800 and will accrue to the local citizens in the form of reduced private, county, and township expenses.

Secondary effects will accrue to the local processor and handlers of the additional crops, livestock, and livestock products, as well as to those providing inputs such as seed, fertilizer, machinery, etc., needed for the increased production.

Traffic will be reduced or eliminated on five township roads due to the removal of bridges and culverts. This will increase traffic on adjacent roads. Five field drive channel crossings will be eliminated which will cause inefficiency in some farming operations. Thirteen existing bridges and culverts will be

replaced with larger structures which will reduce flooding over roads at these locations. Through traffic will be provided with the installation of a bridge on a township road presently without a crossing.

The construction of the project will provide approximately 80 man-years of employment of which 15 to 20 man-years would involve the locally unemployed and underemployed. The project will provide from 1.5 to 2 man-years of employment of the unemployed and underemployed annually.

The establishment of grass strips (450 acres) along each side of the channel along with the field windbreaks will provide additional aesthetic open space. The graves in the cemetery adjacent to main No. 1 and Highway No. 75 will be protected against erosion damage with the installation of the grade stabilization structures and riprap. The improved livability within the watershed will provide more incentives for the present population to remain in the area.

The removal of approximately 252 acres of cropland from agricultural production for channels and structure sites will reduce total net income of the farm operators by \$5,100 annually. Secondary effects from the reduced acreage will also accrue to the local processors, handlers, and dealers in the form of reduced sales. However, the loss is more than offset by increased production on the benefited acreage.

The forest land will provide native vegetation, wildlife habitat, recreation, protection of the flood plain, and limited wood production.

The development of conservation and forest management plans will provide a base for the conservation use and treatment of soil and water resources of the land unit.

Favorable Environmental Effects

1. Increase land adequately treated from 20,680 to 49,450 acres.
2. Reduce wind erosion from 20 to 4 tons per acre on 12,000 acres.
3. Reduce annual wind and water erosion from 1.1 to 0.8 ton per acre.
4. Reduce nutrient (N,P,&K) pollution into drainage systems.
5. Increase wildlife habitat.
6. Increase scenic variety of featureless lake plain on 800 acres.
7. Reduce acres flooded on a 5-year frequency flood event from 18,200 to 0 acres.

8. Reduce annual flood and streambank erosion damage by 73 percent.
9. Reduce land voiding from 0.75 to 0 acre per year.
10. Reduce sedimentation outflow from 37,500 to 18,000 tons per year.
11. Improve surface drainage on 4,000 acres of cropland.
12. Improve maintenance program of channels.
13. Reduce contributing drainage area of judicial ditch 53 system.
14. Reduce placement of snow in the channel from the snow removal operations on the roads.
15. Reduce operating hazards along channels.
16. Increase farm income an average of \$1,175 for each of the 85 land users.
17. Increase crop production.
18. Increase employment opportunities.

Adverse Environmental Effects

1. Reduce temporarily the soil fertility on 55 acres of spoil bank area.
2. Increase sediment during construction.
3. Increase peak discharge into Red River.
4. Reduce or eliminate traffic on five township roads by removal of bridges and culverts.
5. Removal of 252 acres of cropland from production will reduce net income to land users by \$5,100 annually.
6. Removal of five acres of forest land.

ALTERNATIVES

Alternatives considered in the development of the plan are as follows:

Land Treatment

The application of all possible conservation practices is an alternative. The cost of land treatment measures is estimated at \$560,000. Such measures as conservation cropping systems, minimum tillage, crop residue management, field windbreaks, tree planting, pasture and hay land management, wildlife and upland habitat management, and related measures would be applied on the watershed.

The impacts of this alternative are:

1. Reduce floodwater damages by 3 percent. This represents about \$4,700 of the total floodwater damages.
2. Increase land adequately treated from 20,680 to 46,500 acres.
3. Increase wildlife habitat.

4. Reduce annual wind and water erosion from 1.1 to 0.8 ton per acre.
5. Improve environmental aesthetics on adequately treated areas.
6. Reduce sedimentation from 37,500 to 33,300 tons per year.

Single-Purpose Flood-Prevention Structure and Channel Work

Installation of a single-purpose floodwater-retarding structure and channel work is an alternative. The structure would be located in section 34, T. 147 N., R. 46 W. The channel work would be similar to that in the plan. The retarding structure and channel work would cost approximately \$1,720,000.

This combination of structural measures would provide 5-year frequency flood-free protection and drainage of surface waters.

The impacts in relation to judicial ditches 52 and 54, lateral 1, systems of this alternative are:

1. Relocate one farming operation.
2. Reduce acres flooded from a 5-year frequency flood event from 18,200 to 0 acres.
3. Reduce road and bridge damage by 56 percent.
4. Reduce land voiding from 0.75 to 0 acre per year.
5. Improve maintenance program on channels.
6. Reduce contributing drainage area on judicial ditch 53 system.
7. Reduce placement of snow in the channel from the snow removal operations on the roads.
8. Reduce operating hazards along channels.
9. Reduce temporarily the soil fertility on 55 acres of spoil bank area.
10. Increase sediment during construction.
11. Increase peak discharge into Red River.
12. Reduce or eliminate traffic on five township roads by removal of bridges and culverts.
13. Removal of 5 acres of forest land.
14. Removal of 670 acres of cropland from agricultural production.
15. Reduce annual flood and streambank erosion damage by approximately 73 percent.
16. Reduce sedimentation outflow from 37,500 to 22,500 tons per year.
17. Improve wildlife habitat.

Diked Floodway

The establishment of a diked floodway is an alternative. This would involve the construction of dikes along the existing

channels, enlargement of bridges, installation of pumping systems, and the construction of collection channels and collection basins. The diked area would be similar to the channel work in the plan. This plan would require the use of pumping systems to remove the surface waters from the fields. The diked floodway system would cost approximately \$2,700,000. The annual operation and maintenance cost is estimated at \$32,000.

This diked floodway system would provide 5-year frequency flood-free protection and drainage of surface water.

The impacts in relation to judicial ditches 52 and 54, lateral 1, systems of this alternative are:

1. Reduce acres flooded from a 5-year frequency flood event from 18,200 to 0 acres.
2. Reduce road and bridge damage by 56 percent.
3. Reduce annual flood and streambank erosion damage by approximately 73 percent.
4. Reduce land voiding from 0.75 to 0 acre per year.
5. Improve early spring runoff from fields with reduced snow deposition in channels.
6. Reduce operating hazards along channels.
7. Increase of sediment during construction.
8. Reduce or eliminate traffic on five township roads by removal of bridges and culverts.
9. Removal of 590 acres of cropland from agricultural production.
10. Improve wildlife habitat.

No Project

The alternative of not having a project is also to be considered. The existing land and water resource problems would continue.

The present ongoing program in the application of conservation practices would be continued. However, the application rate would only be approximately 40 percent of what would take place during the project installation period.

The proposed plan would provide average annual benefits of \$163,300 at an average annual cost of \$114,350. A total of \$48,950 in average annual net benefits would be foregone by not implementing the plan.

SHORT TERM VS. LONG TERM USE OF RESOURCES

The plan provides for a level of protection consistent with the present and projected use of the land in the watershed.

No foreseeable change in the present agricultural land use is anticipated. The conservation measures will permit continued use of the land by future generations. The structural measures will provide additional protection to the land that will be needed for future use. The level of protection provided by this project can be used as a base for additional measures of protection if the economic conditions demand more intensive use of the lake plain.

The project is designed to be fully effective for the entire 50-year evaluated life. With proper maintenance, the structural measures can be effective for a much longer period.

The watershed is located within the Red River Subregion of the Souris-Red-Rainy Region, under the jurisdiction of the Upper Mississippi River Basin Commission, as designated by the Water Resource Council. The drainage area of the Red River Subregion is approximately 40,000 square miles. There is one pilot watershed that has been completed in North Dakota.

There are 42 Public Law 83-566 active applications for assistance within the Red River Subregion. These applications cover an area of 10,202 square miles or 25 percent of the region.

There are 27 projects that have been authorized to develop plans in the subregion. The area covers 6,452 square miles or 16 percent of the area.

Of those authorized for planning, 18 have been approved for construction. The area covers 4,429 square miles of 11 percent of the area.

There are nine projects in which the construction has been completed. This involves 2,394 square miles or 6 percent of the subregion.

The projects installed under Public Law 83-566 consist of conservation land treatment, floodwater retarding reservoirs, multipurpose structures, diversions, dams, floodways, channel diversions, and channel improvement.

The installation of this plan, in combination with the other projects that are authorized or have preauthorization planning completed prior to December 1967, will have a minor effect on the reduction of floodwater damages in the Red River Subregion.^{24/}

^{24/} Appendix D. Flood Damage Reduction, Souris-Red-Rainy River Basin Commission.

IRREVERSIBLE AND IRRETRIEVABLE COMMITMENTS OF RESOURCES

The project will require a total of 546 acres of land for the channels, spoil banks, berms, and grade stabilization structures. Acres of land by present land use committed to the structural measures are summarized in the following table:

Table 10 - Present Land Use Committed to Features
of the Project
(Acres)

<u>Item</u>	<u>Cropland</u>	<u>Forest Land</u>	<u>Other</u> ^{1/}	<u>Total</u>
Main No. 1-----	140	2	155	297
Main No. 1, Branch 1-	16	0	17	33
Main No. 1, Branch 2-	42	0	24	66
Main No. 2-----	54	3	40	97
Total-----	252	5	236	493

1/ Existing channel and grassed spoil banks.

Of the total acreage, 273 acres will be occupied by the channel including the side slopes and grade stabilization structures. Two hundred twenty acres will be for the berms and spoil banks. An additional 53 acres are included in the needed land rights acreage, needed primarily for construction and maintenance. This land is expected to remain in its present use.

All land required for structural measures with Public Law 83-566 cost-sharing will be purchased by perpetual easement. The easement will remain in effect for the economic life of the project.

The project will require a capital investment of \$1,341,900 of Public Law 83-566 funds and \$945,600 of other funds, precluding the use of this capital for other investments or projects. Approximately 80 man-years of labor will be invested for the installation of the project, of which 15 to 20 man-years would involve the locally unemployed and underemployed.

CONSULTATION AND REVIEW WITH APPROPRIATE AGENCIES AND OTHERS

General

An application for assistance under Public Law 83-566 was submitted to the Minnesota State Soil Conservation Committee^{25/}

^{25/} The State Soil Conservation Committee was renamed as the State Soil and Water Conservation Commission. On July 1, 1973, the Commission was incorporated within the Minnesota Department of Natural Resources.

for the Governor of Minnesota on August 16, 1963. The State Committee approved the application on December 12, 1963, and placed it on priority for planning on July 27, 1964. The preliminary investigation report was presented at a public meeting in Beltrami, Minnesota, on May 10, 1966. The Sponsors decided to proceed with the development of a Public Law 83-566 plan.

During the development of the plan, a tri-agency biology inventory was made of the biological resources of the watershed. This report made recommendations to consider in the development of a plan.^{26/}

A recommendation stated that the natural grassland in the eastern half of section 32 and western half of section 33, T. 147 N., R. 45 W., be preserved to save the habitat of the prairie grouse. This was discussed with the Sponsors, and they recommended that some agency or organization be asked to purchase the area. The Bureau of Sports Fisheries and Wildlife and the Minnesota Department of Natural Resources were contacted about possible purchase. The Bureau of Sports Fisheries and Wildlife stated that this was not eligible for purchase with the funds they administer. The Department of Natural Resources investigated the proposal and recommended against any purchase.

Another recommendation of the biology team was the purchase of 320 acres of land in the north half of section 18, T. 146 N., R. 47 W. The Nature Conservancy was contacted about possible purchase. To date, there has been no indication of interest from them.

The Minnesota Historical Society was contacted for any known archeological and historical information on record which might be affected. The information was utilized in the development of the plan.

The Minnesota Department of Natural Resources made a recommendation that diked floodways be constructed adjacent to the existing ditches in lieu of the proposed plan. The dikes were to be in grass, trees, and shrubs for windbreaks and wildlife habitat. After several meetings between the Department, Sponsors, and the Service, it was agreed the plan as originally proposed was satisfactory.

^{26/} Tri-agency Biology Report was made by representatives of the U.S. Bureau of Sports Fisheries and Wildlife, Minnesota Department of Natural Resources, and the Soil Conservation Service.

Several public meetings were held with the Sponsors and concerned land users to develop a plan satisfactory to them. The Sponsors called a public meeting on March 15, 1973, to review the proposed work plan with the public agencies and organizations. As a result of the review and favorable comments received at this meeting, the Sponsors decided to take the necessary steps to implement the plan.

A public meeting was held in Ada, Minnesota, on February 11, 1975, to review the environmental impact statement. The sponsors decided to continue to take necessary steps to implement the plan.

Discussion and Disposition of Each Comment on Draft Environmental Impact Statement

The following agencies, groups, and individuals were requested to comment on the draft environmental impact statement and did not respond with any comments:

Department of Commerce
Office of Equal Opportunity
Federal Power Commission
Upper Mississippi River Basin Commission
Minnesota State Planning Agency (State Clearing House)
Minnesota Association of Watershed Districts
Minnesota Association of Counties

The following agencies, groups, and individuals commented on the draft environmental impact statement and provided the following comments:

Department of the Army (Corps of Engineers) - Washington, D.C.

Comment:

We have reviewed the work plan and foresee no conflict with any projects or current proposals of this Department. The draft environmental statement is considered to be satisfactory.

Response:

No further response is required.

Department of the Army (Corps of Engineers) - St. Paul District

Comment:

Reference is made to your letter of 16 August 1974, inclosing a copy of the draft environmental impact statement for the Norman-Polk Watershed in Norman and Polk Counties, Minnesota. The draft statement has been reviewed and, in general, we consider the statement to adequately describe the impact of the project

features on the environment of the watershed. However, we did note several typographical errors during the course of the review and we assume that these will be corrected in the final statement.

Response:

Received letter of general concurrence on statement. No further response required. However, the typographical errors are corrected in the final statement.

Comment:

In addition, the Lower Red River Water Resource Group, whose chairman is Arnold Larson from Oslo, Minnesota, is vitally interested in all proposed projects along and in the Red River of the North basin. We suggest that the work plan including the draft impact statement be distributed to this group for their review and comment.

Response:

The plan and EIS has been sent to Arnold Larson.

Department of Health, Education and Welfare

Comment:

We have reviewed the Draft Environmental Impact Statement for the above project. To our knowledge, and based upon the information provided, this project will not impact to any significant degree on the health, education or welfare of the population.

Response:

No further response is required.

U.S. Department of the Interior

Comment:

The environmental impact statement adequately describes the limited amount of project-caused impacts on the fish and wildlife resources of the area. Further, potential environmental impacts related to geologic conditions appear to have been given adequate consideration in the draft environmental statement.

Response:

No further response is required.

Comment:

The statement seems to adequately describe the hydrology of the watershed and the effects of the proposed action on the water resources of the area. We can see no significant deleterious effects on the hydrology of the area as a result of the proposed project; in fact, many benefits should accrue. However, on page 21, last paragraph, and page 36, second paragraph, it is stated that the runoff has a sediment concentration of 2,000 parts per million.

Response:

No further response is required.

Comment:

According to the publication cited (U.S. Geological Survey Hydrologic Investigations Atlas HA-61) the statement should be changed to indicate that the runoff has a sediment concentration in the range of 275 to nearly 2,000 parts per million.

Response:

The environmental impact statement was corrected to read that the runoff of the Red River has a sediment concentration in the range of 275 to nearly 2,000 parts per million.

See page 22, paragraph 1, and page 36, last sentence in the second paragraph.

Comment:

A more recent and more detailed report is available and probably should be cited on water resources of the Wild Rice River watershed of which the subject Norman-Polk watershed is a part. This is U.S. Geological Survey Hydrologic Investigations Atlas HA-339, titled "Water resources of the Wild Rice River Watershed, northwestern Minnesota," published in 1970.

Response:

U.S. Geological Survey Hydrologic Investigation Atlas HA-339 was not used for any reference material in this impact statement. Investigation Atlas HA-61 was used as a source of data for sediment concentration in the Red River. This data was not available in HA-339.

Comment:

On page 27 of the draft environmental impact statement several public recreation facilities proposed under a "County

Parks and Recreation Facilities Plan" are mentioned. However, the draft statement is not clear as to what the impact of these facilities would be on the watershed nor whether the time frame for recreation development is compatible with other watershed development. We suggest that the final environmental statement discuss the above points and that the proposed recreation facilities be indicated on a map in the final statement.

Response:

The public recreation facilities mentioned on page 27 are the county's long range objectives for public recreation in the county. These types of facilities will have only minimal impacts on the structural measures in the watershed. If and when these facilities are installed, they would satisfy a part of the recreational demand in the watershed.

Comment:

We note on pages 27 and 28 of the statement that the National Register of Historic Places and the State Historical Society were consulted with respect to cultural resources in the area of the proposed Norman-Polk watershed. However, it is unclear from the environmental impact statement whether the State Historic Preservation Officer (Mr. Russell W. Fridley, Director, Minnesota Historical Society, 690 Cedar Street, St. Paul, Minnesota 55101) was specifically contacted with regard to any cultural values in the area of the project which may be eligible for inclusion in the National Register. The final statement should provide clarification on this point.

Response:

The State Historic Preservation Officer was contacted with regard to this project. See letter dated September 10, 1974, from Russell W. Fridley to Mr. Harry M. Major in appendix B of the final statement.

Comment:

The State Archaeologist (Dr. Elden Johnson, Department of Anthropology, University of Minnesota, Minneapolis, Minnesota 55455) should be contacted regarding any archeological resources within the area which may be affected by the proposed project. It may be necessary to conduct a professional survey of all lands significantly affected by the proposed project in order to locate and assess presently unrecorded archeological resources.

Response:

The State Archeologist (Dr. Eldon Johnson) was contacted regarding any known archeological resources in the project area. He did not know of any archeological resources in the area at that time. Further consultation did not reveal any sites, but he did request archeological field surveys before construction. See page 13, paragraph 3. A paragraph has been included for cultural assessment and salvage, if necessary.

Comment:

The statement should further reflect procedures to be followed should previously unknown archeological resources be encountered during project development. This should include cessation of work in the immediate vicinity until these resources can be properly assessed and/or salvaged.

Response:

See page 13, paragraph 3. A paragraph has been included for cultural assessment and salvage, if necessary.

U.S. Department of Transportation (Coast Guard)

Comment:

The Department of Transportation has reviewed the material submitted. We have no comments to offer nor do we have any objection to this project.

Response:

No further response is required.

U.S. Department of Transportation (Federal Highway Administration)

Comment:

The draft statement mentions the proposed project will "reduce or eliminate traffic on six township roads by removal of bridges or culverts". However, it does not indicate what the affected roads serve--e.g., do they provide access to farmsteads and residences, or do they merely provide access to fields. It would be desirable to have the proposed road closures, bridge removals, repairs, relocation, etc., shown on the appropriate exhibits.

Response:

A tabular listing of the road closures, bridge removals, repairs, relocation, etc., has been included as Appendix C.

Comment:

The draft indicates the proposed project will have an effect on traffic in the area due to the removal of bridges and culverts. The draft does not appear to reflect appropriate contact or coordination with State and local highway officials. For this reason, we believe it would be appropriate if the State and local highway officials were given the opportunity to review and comment on the draft.

Response:

The draft statement was submitted to the State Highway Department for review and comment. See their response in Appendix B. The County Board of Commissioners was a party in the development of the plan.

U.S. Environmental Protection Agency

Comment:

The judicial ditch systems have drained many shallow lakes, marshes, and wetlands in Minnesota. The EIS should state in detail how the construction of this project or its alternatives will alter the historical negative impact upon water quality, wetlands, and wildlife habitat. One opportunity to provide some mitigation resulting from the perpetuation and proposed improvements of the ditch system would be for the S.C.S. to implement the recommendations made by the Tri-agency Biology Report.

Response:

The land use at around 1900 consisted mainly of grassland, with many shallow marshes and wetlands in the watershed. The largest areas of marshes and wetlands were located in the western portion where there is considerable micro-relief type topography. The general farming in the area consisted mainly of cattle, horses, and some grain. There were trees on many of the beach ridges during this time. Then in the period from 1900 to 1920, several judicial ditch systems were installed to drain the area for agriculture. Since that time, the area has changed to predominately cash farm income from the sale of grain crops.

The Soil Conservation Service is interested in the preservation of marshes, wetlands, etc. The Service has been and will continue to work with local landowners and other agencies in carrying out the recommendations of the Tri-agency Biology Report.

Comment:

According to the EIS, 900 feet of new channel will parallel the Midwest Pipeline. The EIS should describe the material transported in the pipe and address the potential of a spill entering the channel.

Response:

The material transported in the Midwest Pipeline is discussed on page 20, paragraph 6.

Comment:

The EIS indicates that pollution from municipal, industrial, and farm feedlot sources is not believed to have significant effects on fish and wildlife within the watershed. This discussion should be expanded to identify the major point sources of pollution and describe quality of the discharges.

Response:

The section discussing the pollution from the municipal, industrial, and farm feedlot sources has been clarified. See page 26, paragraph 2.

Comment:

The EIS should describe in more detail, the location of the land treatment practices such as field windbreaks, tree planting, farm ponds, and wetland area development.

Response:

The location of the field windbreaks are discussed on page 4, paragraph 2, of the final statement. The location of the other conservation practices will be the responsibility of the landowner working through the soil and water conservation district.

Comment:

Finally, the work plan for the project appears to be adequate and we appreciate the assistance your staff provided at the field review of the project area during the week of September 9, 1974.

Response:

No further response is required.

Comment:

If there are any changes in the proposed project, we suggest that a paragraph summarizing the project changes be included in the Final EIS. Thank you for providing us with the opportunity to review the Draft EIS and Watershed Work Plan. Please provide us with two copies of the Final EIS at the same time it is submitted to the Council on Environmental Quality.

Response:

There is one change in the plan as the result of the draft EIS review. Included is a cultural assessment to be made prior to construction. See page 13, paragraph 3.

Advisory Council on Historic Preservation

Comment:

To insure a comprehensive review of historical, cultural, archeological, and architectural resources, the Advisory Council requests that the final environmental statement contain a copy of the comments of the Minnesota State Historic Preservation Officer concerning the effects of the undertaking upon these resources.

Response:

The final environmental impact contains a letter from the State Historic Preservation Officer. The letter is attached as a part of Appendix B.

Governor of Minnesota

Comment:

The State has reviewed the Work Plan and Draft Environmental Impact Statement for the Norman-Polk Watershed proposed project in Norman and Polk Counties. We concur with the work plan and recommend both that the Environmental Impact Statement be finalized and that this project be approved for operation.

Response:

No further response is required.

State of Minnesota - Department of Highways

Comment:

Main No. 1 The inplace structure under T.H. 75 is a 12'x14' Double Box culvert. The proposed weir will reduce the capacity of this culvert. To minimize the reduction in capacity, consideration should be given to constructing the weir across the end of the apron rather than in the barrel as proposed.

Response:

The construction of a weir on the upstream apron or a straight drop structure immediately upstream of the twin box culvert will be installed. The selected plan will utilize full culvert capacity. See page 10, paragraph 1.

Comment

Main No. 2 The inplace structure under T.H. 75 is a 20'x40' bridge. There are no modifications proposed in the Impact Statement for this structure. We would be concerned if the proposed improvement will result in substantially increased flow velocities increasing the potential scour at this structure.

Response:

The computations show a planned velocity of 1.5 f.p.s. above the bridge and 3.3 f.p.s. below the bridge for a 100-year frequency flow. There is not expected to be an increase in scour around the bridge.

Comment:

General Comments Prior to construction of the proposed improvement, permits from the Highway Department will be necessary at these crossings. Final plans and Special Provisions along with pertinent hydrologic and hydraulic computations and data should be furnished with the request for permit.

Response:

Final plans and specifications along with the hydrologic and hydraulic data will be submitted with the application to the Highway Department for the necessary construction permit.

State of Minnesota - Department of Natural Resources

Comment:

Page 31 the Work Plan states that the lower 2800 feet of the existing channel of main No. 1 flowing in a northwesterly direction will be replaced with 900 feet of new channel flowing straight west to the Red River. On page 32 there is a statement that no project work is planned for the abandoned channel except for that portion within the new channel area. We do not find any information in the Work Plan on the nature of the work on the abandoned channel that will be performed within the new channel area. The Work Plan should include a statement on the work that will be performed in the abandoned channel. If discharge of low flows or parts of flood flows into the abandoned channel is anticipated this information should be given. If discharge from main No. 1 into the abandoned channel is to be prevented, there should be a statement to this effect, and information should be given on the means by which such discharge is to be prevented. The Work Plan should include information as to the magnitude of the flood which will be accommodated in main No. 1 without discharge into the abandoned channel and as to the effects which

greater floods will have on the abandoned channel and on the facilities intended to regulate or prevent flow from main No. 1 into the abandoned channel.

The draft Environmental Impact Statement on pages 7 and 8 has the same information about abandoning the lower part of the existing channel as is given on pages 31 and 32 of the Work Plan. There is no information in the Environmental Impact Statement on the work to be performed in the abandoned channel in the new channel area. The Environmental Impact Statement should include descriptions of the beneficial and adverse effects that the project will have on the abandoned channel.

Response:

The description and use of the abandoned channel has been clarified on page 9, paragraph 1.

The beneficial and adverse effects are included within the reduced sediment volumes leaving the watershed.

Floods of greater magnitude than the 5-year frequency flood will continue to flood out on cropland, pastureland, etc. See page 5, paragraph 1.

See page 9, paragraph 1, for discussion of dikes along the abandoned channel.

Comment:

Main No. 1 is to be located along the north boundary of township 146 north, ranges 46 through 49. The project maps in the Work Plan and in the Environmental Impact Statement show that areas to be benefited are located north of main No. 1. The Work Plan on page 54 and the Environmental Impact Statement on page 16 state that the Wild Rice Watershed District will be responsible for financing and implementing the maintenance work and the Work Plan on page 52 states that the Wild Rice Watershed District will be securing land rights for the structural measures. In ranges 45, 46, & 47, the north boundary of the Wild Rice Watershed District is on the north boundary of township 146 North, and some benefited areas shown on the project maps are thus outside of the Wild Rice Watershed District. The Sand Hill River Drainage and Conservancy District adjoins the Wild Rice Watershed District on the north in this area. The benefited areas north of main No. 1 are probably not tributary to main No. 1 in some instances, and some of the benefited areas are shown by the project maps to be outside of the watershed of main No. 1. The benefits to the areas outside of the watershed are perhaps benefits that may be anticipated because of reduced overflow from main No. 1.

It is questionable whether the Wild Rice Watershed District has the authority to levy assessments outside of its boundaries, and it is questionable whether lands outside of the watershed of main No. 1 may be properly included within the Wild Rice Watershed District. It is possible that the lands north of main No. 1 which may anticipate benefits from the improvement of main No. 1 may also be enjoying benefits from the improvement of the Sand Hill River. The Work Plan and the Environmental Impact Statement should provide information on the location of the present boundaries of the Wild Rice Watershed District and the Sand Hill River Drainage and Conservancy District in the project area, on the possible need for changes in these boundaries on the procedures to be followed in effecting changes in the boundaries, on the extent of lands which are benefited by the improvement of the Sand Hill River and will also be benefited by the improvements proposed in the work plan, and on the problems involved in levying assessments for benefits in areas where the project sponsors do not have jurisdiction and where assessments for benefits in areas where the project sponsors do not have jurisdiction and where assessments may have been levied for benefits from other projects.

Response:

The Wild Rice Watershed District is the legal entity of government that plans to install the project according to state statutes. It will be the responsibility of the Watershed District to determine what areas will be benefited and what areas will be assessed. The determination of making assessments outside the boundaries of the watershed district is the responsibility of the Watershed District in accordance with state statutes.

Comment:

The project maps in the Work Plan and in the draft of the Environmental Impact Statement show grade stabilization structures S-1 and S-2 close to the Red River. The Work Plan on page 31 and the Draft Environmental Impact Statement on page 8 seems to say that the outlet channel between structure S-1 and the Red River will be only 100 feet long. The Work Plan on page 36 and the Draft Environmental Impact Statement on page 12 seems to say that the outlet channel between structure S-2 and the Red River will be only 100 feet long. The aerial photograph which is Appendix D of the Environmental Impact Statement also shows structures S-1 and S-2 very close to the Red River. Each structure site is on the outer bank of a sharp bend of the Red River and there appears to be a rather strong possibility that these outer banks are eroding banks. If it is true that there are eroding banks, there is danger that structures S-1 and S-2 will be destroyed when the Red River has shifted from its present

location at each site to a location such that the lower end of the structure will be undermined. The Addendum to the Work Plan on page 7, the Work Plan on pages 44 and 45, and the Environmental Impact Statement on page 45 specify the amount of reduction in sediment from the watershed that will be deposited in the Red River. Although the Addendum is not in agreement with the Work Plan and the Environmental Impact Statement as to the amount of the reduction, all three show that the reduction will be very substantial. The sediment that has been deposited from this watershed may have had a substantial effect in reducing erosion on the outer banks of the Red River at the sites of structures S-1 and S-2, especially the latter, and with reduced sediment inflow from the Norman-Polk watershed after completion of the project erosion of the outer banks of the Red River may accelerate. The Work Plan has no information on the condition of the Red River at the outlets of mains 1 and 2, except for quality of water information on page 6 and except for information on the 5-year-frequency discharge on page 4 and such information has been omitted from the Draft Environmental Impact Statement. Both of these documents should be revised to include information on the condition of the Red River at the outlets of mains 1 and 2, on flood stages in the river at these points, on any ice jam problems that may develop in the river, on effects of flood flows in the river on the stability of structures S-1 and S-2, on the effectiveness of the structures S-1 and S-2 stilling basins with the Red River at intermediate stages or at flood stage, on the danger of deposition of river sediments in the structure outlet channels, on the measures which might protect structures S-1 and S-2 in the event that erosion of river banks threatens these structures and on measures that might control erosion of the river bank near the structure sites. There should be a study of the effects of sediment brought into the Red River from the Norman-Polk watershed on channel stability in the Red River. If a reduction in this sediment will increase the erosiveness of the Red River water and diminish the channel stability of the river, these effects should be listed in the Environmental Impact Statement as adverse effects of the project.

Response:

The environmental impact statement has been expanded to discuss the conditions along the Red River. See page 19, paragraph 1. The erosion of the judicial ditch outlets are discussed on pages 34 and 35 of the environmental impact statement.

The flood stages have been discussed on page 19, paragraph 2.

Grade stabilization structures S-1 and S-2 are designed as chute spillways to allow the ice blocks to move out of the watershed into the Red River. This type of structure is expected to have a negligible effect on any ice jams that may develop or move downstream on the Red River.

The grade stabilization structures S-1 and S-2 are designed to remain stable with the various floodflow elevations that will occur on the Red River.

The stilling basins of structures S-1 and S-2 are designed to reduce the water energy, thus reducing erosion at low flows in the Red River. At intermediate and floodflow stages in the Red River, the discharges from the judicial ditches will have the velocity dissipated by the water in the river.

There may be some minor amounts of deposition of river sediments in the structure outlet channels, however, the design of structures S-1 and S-2 should keep the outlet channel relatively clean during periods of low flood on the Red River.

The vegetative measures planned to control erosion are discussed on page 6 and 7. After the project is completed, it will be the responsibility of the sponsors to perform the necessary maintenance to keep erosion under control.

The reduction of sediment from the Norman-Polk Watershed would have only minimal effect on the sediment volume in the Red River. There is not expected to be any measurable reduction of sediment in the Red River that would effect erosion on the Red River.

Comment:

Page 72 of the Work Plan states that design discharge for the stabilization structures was based on 50-year-frequency. There is no analysis to show the added cost that would result from building the structures for more severe storms such as 100 year storms. It is especially important that such information be presented for structure S-1, where a large watershed that under present conditions discharges down a long gradual slope will be made to discharge over an abrupt drop to the river. Failure of structure S-1 because of insufficient hydraulic capacity, poor foundation condition, unanticipated hydraulic effects of river flow across the chute of the spillway, or because of any other inadequacy of design or construction, will almost certainly increase channel erosion so that soil loss and sedimentation will be far greater than with the channel in its present location and in its present condition. The Work Plan and the Environmental Impact Statement should be revised to include information on the anticipated effects of flow greater than 50-year flows on the stabilization structures, S-1 and S-2, the information presented should be based on thorough study. If ample reserve capacity for these structures can be provided economically, such capacity should be provided, and the Work Plan and the Environmental Impact Statement should state that it will be provided. If ample reserve capacity cannot be provided economically for structure S-1, consideration might be given to

the use of the abandoned channel as an emergency spillway, and the Work Plan should then include provision for construction of a control structure where main 1 crosses the upper end of the abandoned channel and for maintenance of the abandoned channel in a condition that would permit its use for an emergency spillway. If ample reserve capacity cannot be provided economically for structure S-2, the Work Plan and the Environmental Impact Statement should warn of the limitations on the capacity and should present information on the probable effect of the failure of structure S-2. The statements on page 72 of the Work Plan as to the design criteria for the channels and their appearances and the combinations of factors for which the design was made does not clearly apply to structures S-1 and S-2 and are not sufficiently informative if they do apply.

Response:

The channels are designed to carry the floodwaters of a 5-year-frequency flood event. Floodwater volumes larger than the designed channel capacity will continue to flood out across cropland, pasture-land, etc. For safety of the structures, they were designed to carry the 50-year-frequency flood event in accordance with state SCS standards.

Comment:

On page 45 of the Work Plan and on page 39 of the Environmental Impact Statement there is the statement that the frequency of flooding will be reduced from once every year to once every 5 years, and there is the immediately following statement that acres flooded from the runoff of a 5-year-frequency storm will be reduced from 18,200 to 0 acres. I understand the second statement to mean that acres flooded from the runoff of a 5-year-frequency storm will be reduced to 0 acres from 18,200 acres. If this interpretation is correct, there is an inconsistency with the preceding statement, since if zero acres are to be flooded with a 5-year-frequency storm, then the frequency of flooding will be less than once every five years.

On page 73 of the Work Plan there is the statement that the hydraulic gradient for main No. 1 and branches 1 and 2 are designed for the same elevation as the low points in the field, which are often one-half mile or more from the channel. On page 74 there is the statement that the hydraulic gradient for main No. 2 is designed for the same elevation as the points in the field. Although hydraulic gradient is not defined in the Work Plan or in the draft of the Environmental Impact Statement, I assume it to mean the water surface profiles in the mains when the discharge is equal to the discharge occurring once in 5 years on the average. If this water surface is at the same elevation as the low spots in the fields, there would be no flooding from the 5 year runoff

and the frequency of flooding with the project will be less than once every 5 years. If the statements that 0 acres will be flooded by the runoff of a 5-year-frequency storm are correct, then the Work Plan and the Environmental Impact Statement should be revised so that the reduction in the frequency of flooding is correctly stated.

Response:

See clarification on frequency of flooding on page 39, paragraph 4.

Comment:

The Environmental Impact Statement on page 31 states that the area flooded by a 100-year-frequency flood is 18,400 acres within the watershed and that the area flooded by the runoff from a 5-year-frequency storm is 18,200 acres. The Environmental Impact Statement on page 39 states that the acres flooded from the runoff from a 5-year-frequency storm will be reduced from 18,200 to 0 acres, presumably meaning that the acres flooded will be reduced to 0 acres for 18,200 acres. The same information is given on page 15 and 45 of the Work Plan. I cannot find any information in either document on the acreage that will be flooded by a 100-year-frequency flood with construction completed. This information should be given and the location of the lands that will be flooded by the 100-year-frequency flood shown on a map or by other means. It would be desirable, also, to give information on acreage that will be flooded after construction is complete with floods of 10-year-frequency, 25-year-frequency, and 50-year-frequency. This information is essential to present the development of false expectations that they will be protected from all floods on the part of owners or purchasers of lands that will be affected by floods of these frequencies, and is also essential for use by the persons who will determine the assessments to be paid by each tract of land.

Response:

With the nearly flat topography in the watershed, hydrographs and flood routings were not developed for the various floods. Area flooded under present conditions is based upon interviews with local farmers. Because of the type of analysis used in planning the project, acres flooded under project conditions was not determined.

Comment:

On page 80 of the Work Plan there is a section on concrete chute spillway foundation investigations. This section states with respect to sites S-1, S-2 and S-3 that standard penetration tests were performed at each site and that these tests were supplemented by flight power auger borings. There is also a statement the site S-1 was moved. It is not clear whether the tests were at the site originally investigated, at the new site, or both. The section on foundation investigations also states that geologic information was extrapolated from site S-2 to the present location. The meaning is not clear, but the meaning seems to be applicable to the second site of structures S-1, and that no separate geologic investigation at the second site of structure S-1 was made. If it is true that no geologic investigation was made at site S-1, a geologic investigation should be made there. Site S-1 is at the downstream end of a large watershed, and failure of structure S-1 may result in serious erosion damage besides the damage to this expensive structure. The Work Plan should include information on possible alternatives to the construction of structure S-1 at the chosen site in the event that geologic investigation of the site and construction planning site investigations reveal conditions that make the site unsuitable. The Work Plan and the Environmental Impact Statement should include warnings that there has been no geologic investigation at site S-1, should state that such an investigation will be made as a part of the pre-construction engineering work, and should emphasize that a major alteration in structure location may be necessary if the geologic investigation shows that the site is unsuitable.

Response:

The Soil Conservation Service performs those engineering and geologic investigation studies in the planning phase that are needed to ascertain the physical feasibility of the proposed engineering works, to establish reasonable cost/benefit estimates, and to evaluate valid alternative engineering proposals.

Detailed engineering and geologic investigations will be carried out on all sites in the final design stage prior to construction.

Although no detailed geologic investigations were made at site S-1, we are satisfied with our geologic information obtained in the general area that a safe structure can be constructed.

Comment:

The Work Plan on page 25 states that the alternative of installing a single purpose floodwater retarding structure and channel work would reduce placement of snow in the channel from

the snow removal operation on the roads. On page 47, the Work Plan states that snow that is removed from roadways will be on the berms and not in the channel. The same statement is on page 42 of the Environmental Impact Statements. The channels are mostly east-west channels on the south sides of east-west roads. Snowbanks on the berms resulting from road plowing will be on the north sides of channels. These snowbanks will in many instances act as snow fences and cause drifting of snow in the new channels. Although the enlargement of the channels and the increased distance from the roads to the channels will obviously reduce the construction of the channels resulting from snow deposition, the Work Plan and the Environmental Impact Statement should warn that the improved channels will be susceptible to obstruction by drifting snow to a greater or lesser degree.

Response:

The discussion on the deposition of snow in the new channels has been clarified. See page 42, paragraph 1. We agree that there can be snow drifting in the channels, but this should not take as long to break up as the snowpack from the roadways.

Comment:

The Work Plan on page 47 states that main No. 1 will reduce the land tributary to judicial ditch 53 by 4 square miles and will thus reduce floodwater volumes in the lower reaches, and the Environmental Impact Statement in item 13, page 45, says that reducing the contributing drainage area of the judicial ditch 53 system will be a favorable environmental effect of the project. There is no listing of the corollary adverse environmental effect on the flows in main No. 1 that result from this change. The Environmental Impact Statement should be revised on page 45 so that the list of adverse environmental effects lists the increase in floodwater volumes in main No. 1 that will result from the addition of the 4 square miles of drainage area.

Response:

The channel design capacity of main No. 1 takes into account the additional runoff from the additional 4 square miles. With main No. 1 designed to provide 5-year-frequency flood-free protection, we do not see any adverse environmental effects by bringing this additional 4 square miles of land into the main No. 1 system.

Comment:

The Norman-Polk Watershed is in an area where natural divides between watersheds are poorly defined, where watercourses and drainage ditches in one watershed are interconnected with watercourses and drainage ditches in adjacent watersheds, where floodwaters flow across country from one watershed into adjacent watersheds and where highway embankments and other works cause diversions of water or act as watershed boundaries. This is also an area where watershed boundaries for flood flows may not be the same as low flow boundaries. Presumably the Norman-Polk Watershed had boundaries which are poorly defined and it is probable that there are places where under present conditions floodwaters from the watershed flow across the boundary into adjacent watersheds and places where floodwaters from adjacent watersheds and places where floodwaters from adjacent watersheds flow into the Norman-Polk Watershed. There is no information in the Work Plan as to flows across the watershed boundary or as to the nature and characteristics of the present boundaries of the watershed. The Work Plan and the Environmental Impact Statement should be revised to provide information as to which reaches of the watershed boundary are so well defined that no inter-watershed flow occurs, as to the locations where inter-watershed flow into the watershed occurs, and as to the locations where inter-watershed flow out of the watershed occurs, and should provide information on the effects that construction of the project will have on inter-watershed flow.

Response:

There are no known significant areas where floodwaters enter the Norman-Polk Watershed from adjacent watersheds. However, there is a concrete conduit in the northwest corner, sec. 6, T. 146 N., R. 47 W., that allows water to flow from judicial ditch 52 main north into the Sand Hill Watershed.

The construction of the planned channels and side inlets are designed to control the runoff from floods up to and including the 5-year-frequency event. Floods greater than the 5-year-frequency event will continue to flood adjacent to land within the watershed.

It will be the responsibility of the watershed district to control the placement of additional ditches and culverts in order to maintain the established channel network and watershed divide.

Comment:

The Addendum to the Work Plan states on page 4, item 12 that the Environmental Quality Plan includes installation of grade stabilization structures near the outlets of drainage ditches into the Red and Marsh Rivers. The water development project maps in the Work Plan and in the Environmental Impact Statement show a stabilization structure on the north line of section 13, township 146 north, range 49 west, where judicial ditch 54 discharges into the Marsh River. No stabilization structure discharging into the Marsh River is shown on the project maps in the Work Plan or the Environmental Impact Statement. On page 75 the Work Plan states that there was a request for improvements on judicial ditch 53 but that improvements could not be included in the structural measures described on page 28 and the following pages. According to page 75 the judicial ditch 53 improvement would have included a grade stabilization structure where judicial ditch 53 discharges into the Marsh River. If page 4 of the addendum to the Work Plan is correct and there is to be a grade stabilization constructed discharging into the Marsh River, the main body of the Work Plan, the Environmental Impact Statement, and the project maps and water development project maps should be revised to show where the structure is to be built and to show all facts concerning engineering studies, environmental effects, economic information, etc.

Response:

The statement in the environmental quality plan of the addendum, "includes installation of grade stabilization structures near the outlets of ditches into the Red and Marsh Rivers", is correct. If the environmental quality plan was to be implemented, there would be grade stabilization structures near the outlets of ditches into the Red and Marsh River.

The grade stabilization structure shown on the water development project map is correct. This map shows the location of channel work and grade stabilization structures already installed in the project area.

The structures located on the project map are the structural measures included in the work plan to be installed with Public Law 83-566 assistance.

Comment:

On page 75 the Work Plan states that surveys made of judicial ditch 54, county ditch 3 and county ditch 28, but that local people are improving the channels without federal assistance. These ditches are within the boundary of the Norman-Polk

watershed. On page 29 the Environmental Impact Statement says that local interests are improving these ditches. On page 12 the Work Plan has a section with the title "Soil, Water, and Plant Management Status" in which activities in the Norman-Polk Watershed are described. As noted in comments 12, a stabilization structure is shown on the water development project maps in the Work Plan and in the Environmental Impact Statement at the north boundary of section 3, township 146 north, range 49 west, where judicial ditch 54 discharges into the Marsh River. This structure is not shown on the project maps. If this is an existing structure a note should be added to the water development project map showing that this is true. If the structure is a proposed structure to be built by other agencies, there should be a note showing this fact. If the structure is to be built as part of the Watershed Protection and Flood Prevention Project for the Norman-Polk watershed, it should also be shown on the project maps. According to the engineer's preliminary report to the Board of County Commissioners, Norman County, Improvement of Judicial Ditch 54, dated October 14, 1970, "the westerly one-half mile of ditch No. 54 was recently improved by widening and sloping and constructing an erosion control structure at the outlet into the Marsh River, which functions very well, and no work is contemplated on that part of the ditch." On sheet 4 of the profile which accompanies the engineer's detailed report on this project there is this note: "The ditch was improved from Sta 337+68 to the outlet in Marsh River, and an erosion control structure constructed at the Marsh River - in 1958 by U.S. SCS." If the engineer's report and plans are correct the note on the water development project maps showing that the stabilization structure is an existing structure should be expanded to show that the structure was built under the supervision of the Soil Conservation Service. The section in the Work Plan on page 12 with the title "Soil, Water and Plant Management Status" should be expanded to list among the activities of the cooperators with the Soil and Water Conservation Districts the construction of this structure and the improvement of the channel in the half mile upstream. Additional information should be given on the date of construction, the program under which construction was accomplished, and the effectiveness of the structure. Such information should also be given on page 75 of the Work Plan in the section on judicial ditch 54, county ditch 3 and county ditch 28.

Response:

The grade stabilization structure shown on the water development project map (Appendix F) is already constructed and is not a part of the work plan. All structural measures shown on this map are existing structures.

A discussion of the erosion control structure has been included in the narrative. See page 28, paragraph 5.

Comment:

Remaining wetlands recommended for public ownership include a large area north and adjacent to Agassiz II Wildlife Area (T.146, R.46, S.1, 9, 16, & 21 and T. 147, R. 46, S.28 & 33). Part of this area has already been proposed as a project.

Response:

We agree that public ownership of wetlands is desirable.

Comment:

The natural grasslands in T-147, R.45, S.32-33 are recommended for preservation or purchase. The Division of Fish and Wildlife already has a project (Agassiz II Wildlife Area) adjacent to the proposed PL 566 project area and is purchasing more land as it becomes available. The statement on page 50 of the EIS (paragraph 3) that lands in T. 147, R.45, S.32 & 33 were not recommended for purchase by the DNR, is reported by various Division of Fish and Wildlife personnel to be incorrect.

Response:

During the development of this plan, the Department of Conservation was consulted about possible purchase of the area in question. The response of the area game manager in a letter dated December 19, 1969, was as follows:

"Much of the prairie grouse habitat has been destroyed in the watershed and that habitat that does remain is very small in size and probably not capable of supporting grouse. It is my opinion that we should not purchase any prairie grouse habitat in the Norman-Polk watershed but concentrate our efforts in Area II Region IV on the Burnham Creek watershed area (Polk Co.) and the Syre Area of Norman County."^{27/}

Comment:

It should be indicated what kind of wildlife habitat will increase waterfowl, deer, grouse, etc.

^{27/} Letter from Jerry Maertens to Earl Huber dated December 19, 1969.

Response:

The kinds of wildlife habitat that will be increased consists mostly of increasing the quantity of herbaceous vegetation along the channel work, and also field windbreaks in the vicinity of the channel work. See page 4, paragraph 2, for more detailed description of windbreaks.

The kinds of wildlife that will benefit the most from this habitat improvement includes the following: badgers, skunks, ground squirrels, racoons, pocket gophers, field mice, rabbits, fox, hawks, and various songbirds.

This habitat improvement will not be of significant value to waterfowl, deer, grouse, etc.

Comment:

This area cannot be considered a pheasant range.

Response:

According to a map titled "Range and Abundance of Pheasants in Minnesota 1963", published by the Minnesota Department of Conservation, Division of Game and Fish, the Norman-Polk Watershed is within the pheasant range of Minnesota. However, we agree this is marginal pheasant range.

Comment:

There is a need to delineate present wildlife habitat and consider the losses as opposed to the gains.

Response:

All land is capable of providing habitat for some kinds of wildlife. Specific kinds of habitat such as perennial vegetation along drainage ditches, native prairie blocks, forested areas, and windbreaks, has been recognized in the environmental impact statement. (See page 26.) There are several conservation practices that will improve wildlife habitat. However, it is the local landowners decision on the amount and kind of conservation practices that he will apply. Therefore, it is very difficult to tabulate total gains in wildlife habitat.

Losses of habitat of the kind mentioned above will not occur as a result of the project, except along the area of channel construction. This vegetation will be replaced in sufficient quantity and quality as to more than offset these temporary losses. There is expected to be a total of 450 acres of grasses suitable for wildlife after the project compared to the 236 acres that will be disturbed by the channel work.

Comment:

One-row windbreaks are not beneficial to wildlife. More plantings of various trees and shrubs are needed.

Response:

We agree that one-row windbreaks provide only limited wildlife habitat. Multirow windbreaks of both trees and shrubs provide more beneficial habitat for wildlife. The soil and water conservation districts, with technical assistance from the Soil Conservation Service, will continue to promote wildlife habitat management through the ongoing program.

Comment:

The list of wildlife in the project area should also have included moose, deer, and sandhill cranes. Moose and deer are permanent residents in the watershed. Sandhill cranes are migrants which seasonally utilize the watershed.

Response:

The list of wildlife in the project area has been expanded to include moose, deer, and sandhill cranes. See page 25, paragraph 4.

Agricultural Extension Service

Comment:

What attitudes have changed in the project area that will justify the presumption of greatly increased soil and water conservation practices?

Response:

In recent years there has been a shift in agriculture to more cash crop type farming which requires more conservation practices and flood prevention. With this type of farming and the eroding taking place of the channel outlets, the local interests submitted an application for Public Law 83-566 assistance. As part of providing Public Law 83-566 assistance, it will be necessary to apply conservation practices at an accelerated rate.

Comment:

What species of wildlife are expected to be benefited by and how will they be benefited by minimum tillage and crop residue management?

Response:

The primary consumers such as field mice, songbirds, rabbits, and pheasants, as well as those animals that prey upon rodents, birds, etc., are the major kinds of wildlife benefited by minimum tillage and crop residue management. These practices benefit the wildlife mentioned by providing additional food and cover.

Comment:

Will the construction firms employed for the project hire local people who are most likely unskilled in the operation of earth moving equipment, or will they employ skilled operators from elsewhere?

Response:

The employment of people for the construction of this project is discussed on page 44, paragraph 2, of the draft, and page 44, paragraph 2, of the final environmental impact statement.

Comment:

What are the plans for preparing ditch-side slopes for seeding? Here the specialists suggested that it probably would be important to incorporate a peat or straw mulch into the soil to achieve a stand of protective cover.

Response:

The plans for seeding the side slopes of the channels will be developed in more detail during final design. The preliminary plans call for fertilization, mulching, and seed. See page 6, paragraph 4.

Comment:

What is the fate of channels to be abandoned as a result of the project? Could some of these possibly be deepened and used for irrigation water supply and/or water fowl habitat?

Response:

The channels that are being abandoned will be allowed to revert to a natural area. This channel is presently too steep for developing water supply for irrigation water and/or waterfowl habitat. There are no provisions in the plan to alter the abandoned channel in any way.

Minnesota Historical Society

Comment:

The Draft Environmental Impact Statement for the Norman-Polk Watershed project has been reviewed by the Survey and Planning and Archaeology sections of the Minnesota Historical Society as per your request of 16 August 1974. It is the finding of this review that there are no recorded properties of an archaeological or historical nature located within the project area or which would be directly affected through the implementation of the project as described in the August 1974 Statement. It is requested, however, that should the implementation of the construction phase of the watershed project lead to the discovery of archaeological materials, the Minnesota Historical Society be contacted immediately.

Response:

The plan has been expanded to include a section on a cultural assessment and what will be done if archeological materials are found. See page 13, paragraph 3.

Minnesota Association of Soil and Water Conservation Districts

Comment:

In the limited time I had, I believe the favorable environmental effects outweigh the adverse effects. In considering the alternatives, I believe the project very worthwhile and should be approved as presented.

Response:

No further response is required.

Agassiz Audubon Society

Comment:

Water will be entering an already overloaded river during spring runoff. Land located to the north along the Red River of the North will be exposed to a greater flood threat during peak runoff years.

Response:

There is a discussion on the impacts of flooding on the Red River of the North on page 41, paragraph 6. Also, on page 48, paragraph 9, there is a discussion on how similar Public Law 83-566 projects would effect the flow on the Red River of the North.

Comment:

Drainage ditches in the past have provided very poor habitat for wildlife. After reading this report, it appears that wildlife will again be the losers if this project is allowed to proceed.

Response:

The plan is developed to provide wildlife habitat as part of the channel work. The channel side slopes, berms, and spoil banks will be seeded with grasses that are beneficial to wildlife. See page 6, paragraph 5; page 16, paragraph 3; page 39, paragraph 1; and page 41, paragraph 1, for further discussion on wildlife habitat.

Comment:

Seemingly as a result of this ditch, more land owners will be encouraged to drain the few remaining marsh lands that still exist. Wet prairies will also be in danger as drainage becomes more feasible.

All lands currently not being farmed or unsuitable for crop land should be put into public ownership and converted to natural grasslands for Wildlife use.

Response:

The Soil Conservation Service has no control over land use, therefore, cannot dictate how landowners manage their holdings. Soil Conservation Service policy prohibits Service personnel from providing technical assistance to landowners and operators who wish to drain Type III, IV, or greater wetlands. However, the Soil and Water Conservation Districts of Minnesota, with technical assistance from the Soil Conservation Service, will continue to promote wildlife habitat management through their ongoing program.

Comment:

Lake Agassiz beachlines should not be cut through by ditches. These areas still contain large tracts of native grasslands which currently provide habitat for many species of wildlife such as the endangered Prairie Chicken.

Response:

The existing plan does not cut through the beachlines with new channels. The plan includes channel work that improves the capacity of the previously modified channels.

Comment:

Past Conservation techniques such as Pits and Ponds have been of little value to Waterfowl.

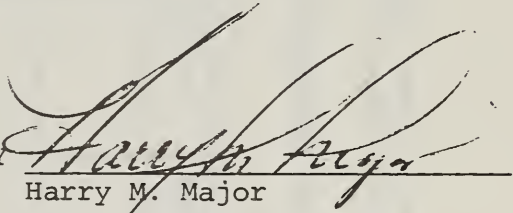
Response:

The value of pits and ponds varies depending on many factors such as their locations in respect to other water areas, such as large marshes and other habitat. However, there is general agreement that pits and ponds are valuable and provide the desired benefits for waterfowl for courting, breeding, brooding, and other uses.

LIST OF APPENDIXES

- Appendix A - Comparison of Benefits and Costs for Structural Measures
- Appendix B - Letters of Comment Received on the Draft Environmental Impact Statement
- Appendix C - Bridge, Culvert, and Road Modifications
- Appendix D - Structure Outlet Area
- Appendix E - Project Map
- Appendix F - Water Development Project Map
- Appendix G - Glossary of Terms

APPROVED BY


Harry M. Major

State Conservationist

DATE


March 17, 1975



Appendix A - Comparison of Benefits and Costs for Structural Measures

Norman-Polk Watershed, Minnesota

(Dollars)

Evaluation Unit	AVERAGE ANNUAL BENEFITS ^{1/}					Average Annual Cost	Benefit Cost Ratio
	Damage Reduction	More Intensive Land Use	Drainage	Redevelopment	Secondary	Total	
Main No. 1 Channel Work and Grade Stabilization Structures S-1, S-1A, S-1B, S-1C, and S-1D Main No. 2 Channel Work and Grade Stabilization Structure S-2	111,830	11,450	14,170	9,250	16,600	163,300	1.6:1
Project Administration							
Grand Total	<u>2/</u> 111,830	11,450	14,170	9,250	16,600	163,300	<u>3/</u> 1.4:1

^{1/} Price base - Adjusted normalized.

^{2/} In addition, land treatment measures are estimated to provide flood damage reduction benefits of \$2,930 annually.

^{3/} Based upon ~~5~~-3/8% discount rate applicable when the plan was developed. The benefit cost ratio is 1.3:1.0 based upon the discount rate of 5-7/8%, 1973 price levels for construction and adjusted normalized values for benefits.

April 1974



DEPARTMENT OF THE ARMY

WASHINGTON, D.C. 20310

23 OCT 1974

Honorable Robert W. Long
Assistant Secretary of Agriculture
Washington, D. C. 20250

Dear Mr. Long:

In compliance with the provisions of Section 5 of Public Law 566, 83d Congress, the State Conservationist, on behalf of the Administrator of the Soil Conservation Service, by letter dated 16 August 1974, requested the views of the Secretary of the Army on the Watershed Work Plan and Draft Environmental Statement for the Norman Polk Watershed, Minnesota.

We have reviewed the work plan and foresee no conflict with any projects or current proposals of this Department. The draft environmental statement is considered to be satisfactory.

Sincerely,

A handwritten signature in cursive script, reading "Charles R. Ford", is positioned above the typed name.

Charles R. Ford
Chief
Office of Civil Functions



DEPARTMENT OF THE ARMY
ST. PAUL DISTRICT, CORPS OF ENGINEERS
1210 U. S. POST OFFICE & CUSTOM HOUSE
ST. PAUL, MINNESOTA 55101

IN REPLY REFER TO

NCSSED-PB

20 September 1974

Mr. Harry M. Major
State Conservationist
Soil Conservation Service
316 North Robert Street
St. Paul, Minnesota 55101

Dear Mr. Major:

Reference is made to your letter of 16 August 1974, inclosing a copy of the draft environmental impact statement for the Norman-Polk Watershed in Norman and Polk Counties, Minnesota. The draft statement has been reviewed and, in general, we consider the statement to adequately describe the impact of the project features on the environment of the watershed. However, we did note several typographical errors during the course of the review and we assume that these will be corrected in the final statement.

In addition, the Lower Red River Water Resource Group, whose chairman is Arnold Larson from Oslo, Minnesota, is vitally interested in all proposed projects along and in the Red River of the North basin. We suggest that the work plan including the draft impact statement be distributed to this group for their review and comment.

Sincerely yours,

NORMAN C. HINTZ
Major, Corps of Engineers
Acting District Engineer



DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE

REGION V

300 SOUTH WACKER DRIVE
CHICAGO, ILLINOIS 60606

OFFICE OF
THE REGIONAL DIRECTOR

October 21, 1974

Mr. Harry M. Major
State Conservationist
Soil Conservation Service
Department of Agriculture
316 North Robert Street
St. Paul, Minnesota 55101

RE: Draft Environmental Impact Statement
Norman Polk Watershed
Norman and Polk Counties, Minnesota

Dear Mr. Major:

We have reviewed the Draft Environmental Impact Statement for the above project. To our knowledge, and based upon the information provided, this project will not impact to any significant degree on the health, education or welfare of the population.

Sincerely yours,

Robert A. Ford
Regional Environmental Officer

cc: Charles Custard, OEA
Warren Muir, CEQ



United States Department of the Interior

OFFICE OF THE SECRETARY
WASHINGTON, D.C. 20240

OCT 25 1974

PEP ER-74/1048

Dear Mr. Major:

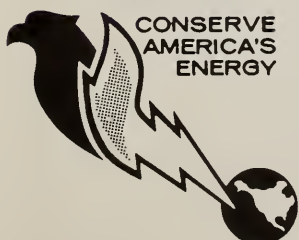
Thank you for your letter of August 16, 1974, requesting our views and comments on a work plan and draft environmental statement for the Norman Polk Watershed, Norman and Polk Counties, Minnesota. We have completed our review of these two documents and will provide you with our comments on the work plan, followed by our comments on the draft environmental impact statement.

Work Plan

The proposed action will not adversely affect any established or studied unit of the National Park Service, any registered National Landmark, or any site now being processed for registration. The need for professional surveys of existing geological, archeological, and historical resources is recognized in the abbreviated environmental quality plan (page 3, component needs, item 4). Means for accomplishing these surveys should also be provided for in the plan.

The known mineral resources of the watershed are briefly described in both the work plan (page 5) and the environmental statement (page 20). "The mineral resources are limited to small surface sand and gravel deposits located in the beach ridge area in the eastern one-third of the watershed."

Although production has been recorded in both counties, our office review indicates that no known mineral resource would be adversely affected by the proposed construction. Also, sponsors of the project are aware of the 24-inch-diameter gas pipeline that traverses the watershed, having routed Branch 2 to avoid it (work plan, page 74). Accordingly, we find no objection to the project's minor involvement with mineral resources and their development.



Save Energy and You Serve America!

Numerous references to fish and wildlife resources and the effects of various aspects of the project on these resources are made throughout the work plan. Fish and wildlife values have been recognized by the SCS and taken into consideration in planning of the project.

The Fish and Wildlife Service and the Minnesota Department of Natural Resources have periodically made specific recommendations regarding acquisition of certain properties on this watershed. These recommendations were discussed on pages 21 and 22 of the work plan. It appears that funding, adequate to accomplish the recommendations, is not available from other government agencies or outside groups. It is also apparent that funding is not available from the SCS or PL-566 programs it administers. These recommendations should be retained as options in the work plan and implemented should funding (from any source) become available in the future.

It is encouraging that our recommendation to delay mowing the ditch banks until after July 15th is in the work plan for implementation in the project.

The work plan should point out the fact that environmental considerations included in the Abbreviated Environmental Quality Plan (pages 2-8) are no more than wishful thinking unless some providential source of funding is found. Sources of funding listed in the plan on page 5 are existent, but at present no indication of availability has been shown.

Draft Environmental Statement

The environmental impact statement adequately describes the limited amount of project-caused impacts on the fish and wildlife resources of the area. Further, potential environmental impacts related to geologic conditions appear to have been given adequate consideration in the draft environmental statement.

The statement seems to adequately describe the hydrology of the watershed and the effects of the proposed action on the water resources of the area. We can see no significant deleterious effects on the hydrology of the area as a result of the proposed project; in fact, many benefits should accrue. However, on page 21, last paragraph, and page 36, second paragraph, it is stated that the runoff has a sediment concentration of 2,000 parts per million.

According to the publication cited (U.S. Geological Survey Hydrologic Investigations Atlas HA-61) the statement should be changed to indicate that the runoff has a sediment concentration in the range of 275 to nearly 2,000 parts per million.

A more recent and more detailed report is available and probably should be cited on water resources of the Wild Rice River watershed of which the subject Norman-Polk watershed is a part. This is U.S. Geological Survey Hydrologic Investigations Atlas HA-339, titled "Water resources of the Wild Rice River watershed, northwestern Minnesota," published in 1970.

On page 27 of the draft environmental impact statement several public recreation facilities proposed under a "County Parks and Recreation Facilities Plan" are mentioned. However, the draft statement is not clear as to what the impact of these facilities would be on the watershed nor whether the time frame for recreation development is compatible with other watershed development. We suggest that the final environmental statement discuss the above points and that the proposed recreation facilities be indicated on a map in the final statement.

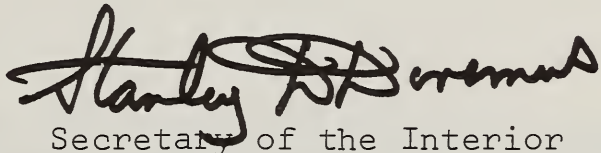
We note on pages 27 and 28 of the statement that the National Register of Historic Places and the State Historical Society were consulted with respect to cultural resources in the area of the proposed Norman-Polk watershed. However, it is unclear from the environmental impact statement whether the State Historic Preservation Officer (Mr. Russell W. Fridley, Director, Minnesota Historical Society, 690 Cedar Street, St. Paul, Minnesota 55101) was specifically contacted with regard to any cultural values in the area of the project which may be eligible for inclusion in the National Register. The final statement should provide clarification on this point.

The State Archaeologist (Dr. Elden Johnson, Department of Anthropology, University of Minnesota, Minneapolis, Minnesota 55455) should be contacted regarding any archeological resources within the area which may be affected by the proposed project. It may be necessary to conduct a professional survey of all lands significantly affected by the proposed project in order to locate and assess presently unrecorded archeological resources.

The statement should further reflect procedures to be followed should previously unknown archeological resources be encountered during project development. This should include cessation of work in the immediate vicinity until these resources can be properly assessed and/or salvaged.

We trust the foregoing comments will assist you in developing the final environmental statement for this watershed.

Sincerely yours,

A handwritten signature in dark ink, appearing to read "Stanley D. Berens". The signature is stylized with a large, looping initial "S" and a prominent "B".

Deputy Assistant

Secretary of the Interior

Mr. Harry M. Major
State Conservationist
Soil Conservation Service
Department of Agriculture
316 North Robert Street
St. Paul, Minnesota 55101



**DEPARTMENT OF TRANSPORTATION
UNITED STATES COAST GUARD**

MAILING ADDRESS:
U.S. COAST GUARD (G-WS/73)
400 SEVENTH STREET SW.
WASHINGTON, D.C. 20590
PHONE: (202) 426-2262

• OCT 4 1974

Mr. Harry M. Major
State Conservationist
Soil Conservation Service
316 North Robert Street
St. Paul, Minnesota 55101

Dear Mr. Major:

This is in response to your letter of 16 August 1974 addressed to Admiral Bender concerning a draft environmental impact statement for the Norman Polk Watershed, Minnesota.

The Department of Transportation has reviewed the material submitted. We have no comments to offer nor do we have any objection to this project.

The opportunity to review this draft statement is appreciated.

Sincerely,

W. E. CALDWELL
Captain, U.S. Coast Guard
Deputy Chief, Office of Marine
Environment and Systems
By direction of the Commandant



U.S. DEPARTMENT OF TRANSPORTATION
FEDERAL HIGHWAY ADMINISTRATION
REGION 5
18209 DIXIE HIGHWAY
HOMewood, ILLINOIS 60430
October 16, 1974

IN REPLY REFER TO: 5-00.5

Mr. Harry M. Major
U. S. Department of Agriculture
Soil Conservation Service
316 North Robert Street
St. Paul, Minnesota 55101

Dear Mr. Major:

We have reviewed the draft environmental statement for the Norman-Polk Watershed, Norman and Polk Counties, Minnesota, and offer the following comments.

The draft statement mentions the proposed project will "reduce or eliminate traffic on six township roads by removal of bridges or culverts". However, it does not indicate what the affected roads serve-- e.g., do they provide access to farmsteads and residences, or do they merely provide access to fields. It would be desirable to have the proposed road closures, bridge removals, repairs, relocation, etc., shown on the appropriate exhibits.

The draft indicates the proposed project will have an effect on traffic in the area due to the removal of bridges and culverts. The draft does not appear to reflect appropriate contact or coordination with State and local highway officials. For this reason, we believe it would be appropriate if the State and local highway officials were given the opportunity to review and comment on the draft.

The opportunity to review and comment on the draft environmental statement for this proposal is appreciated.

Sincerely yours,

H. L. Anderson
Regional Administrator

By:

W. G. Emrich

W. G. Emrich, Director
Office of Environment and Design



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

REGION V

230 SOUTH DEARBORN STREET

CHICAGO, ILLINOIS 60604

Mr. Harry Major
United States Department of Agriculture
Soil Conservation Service
316 North Roberts Street
200 Federal Building
St. Paul, Minnesota 55101

OCT 10 1974

Dear Mr. Major:

In response to your letter of August 16, 1974, we have reviewed the Draft Environmental Impact Statement (EIS) for Flood Prevention and Watershed Protection in Norman and Polk Counties, Minnesota. We have classified our comments as Category LO-2. Specifically, this means we have no major objections to the proposal, however, we believe that more information should be provided in the EIS to adequately assess the environmental impacts of the project. This classification and the date of our comments will appear in the Federal Register in accordance with our responsibility to inform the public of our views on Federal actions under Section 309 of the Clean Air Act. We submit the following comments for inclusion in the Final EIS.

The judicial ditch systems have drained many shallow lakes, marshes, and wetlands in Minnesota. The EIS should state in detail how the construction of this project or its alternatives will alter the historical negative impact upon water quality, wetlands, and wildlife habitat. One opportunity to provide some mitigation resulting from the perpetuation and proposed improvements of the ditch system would be for the S.C.S. to implement the recommendations made by the Tri-agency Biology Report.

According to the EIS, 900 feet of new channel will parallel the Midwest Pipeline. The EIS should describe the material transported in the pipe and address the potential of a spill entering the channel.

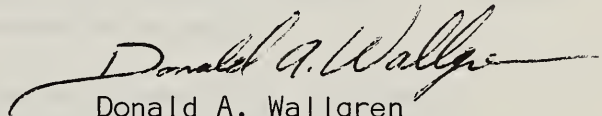
The EIS indicates that pollution from municipal, industrial, and farm feedlot sources is not believed to have significant effects on fish and wildlife within the watershed. This discussion should be expanded to identify the major point sources of pollution and describe quality of the discharges.

The EIS should describe in more detail, the location of the land treatment practices such as field windbreaks, tree planting, farm ponds, and wetland area development.

Finally, the work plan for the project appears to be adequate and we appreciate the assistance your staff provided at the field review of the project area during the week of September 9, 1974.

If there are any changes in the proposed project, we suggest that a paragraph summarizing the project changes be included in the Final EIS. Thank you for providing us with the opportunity to review the Draft EIS and Watershed Workplan. Please provide us with two copies of the Final EIS at the same time it is submitted to the Council on Environmental Quality.

Sincerely yours,

A handwritten signature in dark ink, reading "Donald A. Wallgren". The signature is fluid and cursive, with a long horizontal stroke extending to the right.

Donald A. Wallgren
Chief,
Federal Activities Branch

Advisory Council
On Historic Preservation

1522 K Street N.W. Suite 430
Washington D.C. 20005

September 13, 1974

Mr. Harry M. Major
State Conservationist
Soil Conservation Service
U.S. Department of Agriculture
316 North Robert Street
St. Paul, Minnesota 55101

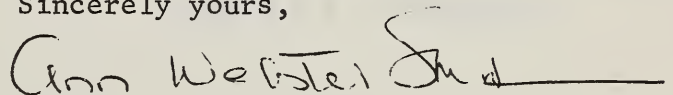
Dear Mr. Major:

This is in response to your request of August 16, 1974, for comments on the environmental statement for the Norman-Polk Watershed, Norman and Polk Counties, Minnesota. Pursuant to its responsibilities under Section 102(2)(C) of the National Environmental Policy Act of 1969, the Advisory Council on Historic Preservation has determined that your draft environmental statement appears procedurally adequate. However, we have the following substantive comments to make:

To insure a comprehensive review of historical, cultural, archeological, and architectural resources, the Advisory Council requests that the final environmental statement contain a copy of the comments of the Minnesota State Historic Preservation Officer concerning the effects of the undertaking upon these resources.

Should you have any questions or require any additional assistance, please contact Jordan Tannenbaum at 202-254-3974 of the Advisory Council staff.

Sincerely yours,



Ann Webster Smith
Director, Office of Compliance



STATE OF MINNESOTA

OFFICE OF THE GOVERNOR

ST. PAUL 55155

WENDELL R. ANDERSON
GOVERNOR

November 14, 1974

Mr. Harry M. Major
State Conservationist
Soil Conservation Service
316 North Robert Street
Saint Paul, Minnesota 55101

Dear Mr. Major:

The State has reviewed the Work Plan and Draft Environmental Impact Statement for the Norman-Polk Watershed proposed project in Norman and Polk Counties. We concur with the work plan and recommend both that the Environmental Impact Statement be finalized and that this project be approved for operation.

With warmest personal regards.

Sincerely,

A handwritten signature in dark ink that reads "Wendell R. Anderson". The signature is written in a cursive style with a large, prominent "W" and "A".

Wendell R. Anderson

WRA:skf



STATE OF MINNESOTA
DEPARTMENT OF HIGHWAYS
ST. PAUL, MINN. 55155

September 26, 1974

Harry M. Major
State Conservationist
U.S. Department of Agriculture
Soil Conservation Service
316 North Robert Street
St. Paul, Minnesota - 55155

In reply refer to: 330
Environmental Impact Statement
Norman-Polk Watershed
C.S. 5409 (T.H. 75)

Dear Mr. Major:

We have reviewed the Draft Environmental Impact Statement transmitted in your letter of August 28, 1974, for proposed improvements in the Norman-Polk County Watershed.

Our review was concerned with the proposed crossings of Main No. 1 and Main No. 2 under T.H. 75. Our comments are as follows:

Main No. 1

The in-place structure under T.H. 75 is a 12'x14' Double Box culvert. The proposed weir will reduce the capacity of this culvert. To minimize the reduction in capacity, consideration should be given to constructing the weir across the end of the apron rather than in the barrel as proposed.

Main No. 2

The in-place structure under T.H. 75 is a 20'x40' bridge. There are no modifications proposed in the Impact Statement for this structure. We would be concerned if the proposed improvement will result in substantially increased flow velocities increasing the potential scour at this structure.

General Comments

Prior to construction of the proposed improvement, permits from the Highway Department will be necessary at these crossings. Final plans and Special Provisions along with pertinent hydrologic and hydraulic computations and data should be furnished with the request for permit.

Thank you for the opportunity to review the Impact Statement. If you have any questions regarding our comments, please advise.

Sincerely,

Paul G. Velz
Road Design Engineer

AN EQUAL OPPORTUNITY EMPLOYER



STATE OF

MINNESOTA

DEPARTMENT OF NATURAL RESOURCES

CENTENNIAL OFFICE BUILDING • ST. PAUL, MINNESOTA • 55155

November 4, 1974

Mr. Harry M. Major
State Conservationist
Soil Conservation Service
200 Federal Building
316 North Robert Street
St. Paul, Minnesota 55101

Dear Mr. Major:

The Department of Natural Resources has reviewed the Draft Environmental Impact Statement and the Work Plan for the Norman-Polk Watershed, and submits the attached comments.

Sincerely,

Archie D. Chelseth
Assistant Commissioner

Attachment

ADC:KDW:md

cc: Peter Gove

COMMENTS

A. Comments of the Division of Waters, Soils, and Minerals

1. Page 31 the Work Plan states that the lower 2800 feet of the existing channel of main No. 1 flowing in a northwesterly direction will be replaced with 900 feet of new channel flowing straight west to the Red River. On page 32 there is a statement that no project work is planned for the abandoned channel except for that portion within the new channel area. We do not find any information in the Work Plan on the nature of the work on the abandoned channel that will be performed within the new channel area. The Work Plan should include a statement on the work that will be performed in the abandoned channel. If discharge of low flows or parts of flood flows into the abandoned channel is anticipated this information should be given. If discharge from main No. 1 into the abandoned channel is to be prevented, there should be a statement to this effect, and information should be given on the means by which such discharge is to be prevented. The Work Plan should include information as to the magnitude of the flood which will be accommodated in main No. 1 without discharge into the abandoned channel and as to the effects which greater floods will have on the abandoned channel and on the facilities intended to regulate or prevent flow from main No. 1 into the abandoned channel.

2. The draft Environmental Impact Statement on pages 7 and 8 has the same information about abandoning the lower part of the existing channel as is given on pages 31 and 32 of the Work Plan. There is no information in the Environmental Impact Statement on the work to be performed in the abandoned channel in the new channel area. The Environmental Impact Statement should include descriptions of the beneficial and adverse effects that the project will have on the abandoned channel.

3. Main No. 1 is to be located along the north boundary of township 146 north, ranges 46 through 49. The project maps in the Work Plan and in the Environmental Impact Statement show that areas to be benefited are located north of main No. 1. The Work Plan on page 54 and the Environmental Impact Statement on page 16 state that the Wild Rice Watershed District will be responsible for financing and implementing the maintenance work and the Work Plan on page 52 states that the Wild Rice Watershed District will be securing land rights for the structural measures. In ranges 45, 46, & 47, the north boundary of the Wild Rice Watershed District is on the north boundary of township 146 North, and some benefited areas shown on the project maps are thus outside of the Wild Rice Watershed District. The Sand Hill River Drainage and Conservancy District adjoins the Wildj Rice Watershed District on the north in this area. The benefited areas north of main No. 1 are probably not tributary to main No. 1 in some instances, and some of the benefited areas are shown by the project maps to be outside of the watershed of main No. 1. The benefits to the areas outside of the watershed are perhaps benefits that may be anticipated because of reduced overflow from main No.1.

It is questionable whether the Wild Rice Watershed District has the authority to levy assessments outside of its boundaries, and it is questionable whether lands outside of the watershed of main No. 1 may be properly included within the Wild Rice Watershed District. It is possible that the lands north of main No. 1 which may anticipate benefits from the improvement of main No. 1 may also be enjoying benefits from the improvement of the Sand Hill River. The Work Plan and the Environmental Impact Statement should provide information on the location of the present boundaries of the Wild Rice Watershed District and the Sand Hill River Drainage and Conservancy District in the project area, on the possible need for changes in these boundaries on the procedures to be followed in effecting changes in the boundaries, on the extent of lands which are benefited by the improvement of the Sand Hill River and will also be benefited by the improvements proposed in the work plan, and on the problems involved in levying assessments for benefits in areas where the project sponsors do not have jurisdiction and where assessments for benefits in areas where the project sponsors do not have jurisdiction and where assessments may have been levied for benefits from other projects.

4. The project maps in the Work Plan and in the draft of the Environmental Impact Statement show grade stabilization structures S-1 and S-2 close to the Red River. The Work Plan on page 31 and the Draft Environmental Impact Statement on page 8 seems to say that the outlet channel between structure S-1 and the Red River will be only 100 feet long. The Work Plan on page 36 and the Draft Environmental Impact Statement on page 12 seems to say that the outlet channel between structure S-2 and the Red River will be only 100 feet long. The aerial photograph which is Appendix D of the Environmental Impact Statement also shows structures S-1 and S-2 very close to the Red River. Each structure site is on the outer bank of a sharp bend of the Red River and there appears to be a rather strong possibility that these outer banks are eroding banks. If it is true that there are eroding banks, there is danger that structures S-1 and S-2 will be destroyed when the Red River has shifted from its present location at each site to a location such that the lower end of the structure will be undermined. The Addendum to the Work Plan on page 7, the Work Plan on pages 44 and 45, and the Environmental Impact Statement on page 45 specify the amount of reduction in sediment from the watershed that will be deposited in the Red River. Although the Addendum is not in agreement with the Work Plan and the Environmental Impact Statement as to the amount of the reduction, all three show that the reduction will be very substantial. The sediment that has been deposited from this watershed may have had a substantial effect in reducing erosion on the outer banks of the Red River at the sites of structures S-1 and S-2, especially the latter, and with reduced sediment inflow from the Norman-Polk watershed after completion of the project erosion of the outer banks of the Red River may accelerate. The Work Plan has no information on the condition of the Red River at the outlets of mains 1 and 2, except for quality of water information on page 6 and except for information on the 5-year-frequency discharge on page 4 and such information has been omitted from the Draft Environmental Impact Statement. Both of these documents should be revised to include information

on the condition of the Red River at the outlets of mains 1 and 2, on flood stages in the river at these points, on any ice jam problems that may develop in the river, on effects of flood flows in the river on the stability of structures S-1 and S-2, on the effectiveness of the structures S-1 and S-2 stilling basins with the Red River at intermediate stages or at flood stage, on the danger of deposition of river sediments in the structure outlet channels, on the measures which might protect structures S-1 and S-2 in the event that erosion of river banks threatens these structures and on measures that might control erosion of the river bank near the structure sites. There should be a study of the effects of sediment brought into the Red River from the Norman-Polk watershed on channel stability in the Red River. If a reduction in this sediment will increase the erosiveness of the Red River water and diminish the channel stability of the river, these effects should be listed in the Environmental Impact Statement as adverse effects of the project.

5. Page 72 of the Work Plan states that design discharge for the stabilization structures was based on 50-year-frequency. There is no analysis to show the added cost that would result from building the structures for more severe storms such as 100 year storms. It is especially important that such information be presented for structure S-1, where a large watershed that under present conditions discharges down a long gradual slope will be made to discharge over an abrupt drop to the river. Failure of structure S-1 because of insufficient hydraulic capacity, poor foundation condition, unanticipated hydraulic effects of river flow across the chute of the spillway, or because of any other inadequacy of design or construction, will almost certainly increase channel erosion so that soil loss and sedimentation will be far greater than with the channel in its present location and in its present condition. The Work Plan and the Environmental Impact Statement should be revised to include information on the anticipated effects of flow greater than 50-year flows on the stabilization structures, S-1 and S-2, the information presented should be based on thorough study. If ample reserve capacity for these structures can be provided economically, such capacity should be provided, and the Work Plan and the Environmental Impact Statement should state that it will be provided. If ample reserve capacity cannot be provided economically for structure S-1, consideration might be given to the use of the abandoned channel as an emergency spillway, and the Work Plan should then include provision for construction of a control structure where main 1 crosses the upper end of the abandoned channel and for maintenance of the abandoned channel in a condition that would permit its use for an emergency spillway. If ample reserve capacity cannot be provided economically for structure S-2, the Work Plan and the Environmental Impact Statement should warn of the limitations on the capacity and should present information on the probable effect of the failure of structure S-2. The statements on page 72 of the Work Plan as to the design criteria for the channels and their appearances and the combinations of factors for which the design was made does not clearly apply to structures S-1 and S-2 and are not sufficiently informative if they do apply.

6. On page 45 of the Work Plan and on page 39 of the Environmental Impact Statement there is the statement that the frequency of flooding will be reduced from once every year to once every 5 years, and there is the immediately following statement that acres flooded from the runoff of a 5-year-frequency storm will be reduced from 18,200 to 0 acres. I understand the second statement to mean that acres flooded from the runoff of a 5-year-frequency storm will be reduced to 0 acres from 18,200 acres. If this interpretation is correct, there is an inconsistency with the preceding statement, since if zero acres are to be flooded with a 5-year-frequency storm, then the frequency of flooding will be less than once every five years.

On page 73 of the Work Plan there is the statement that the hydraulic gradient for main No. 1 and branches 1 and 2 are designed for the same elevation as the low points in the field, which are often one-half mile or more from the channel. On page 74 there is the statement that the hydraulic gradient for main No. 2 is designed for the same elevation as the points in the field. Although hydraulic gradient is not defined in the Work Plan or in the draft of the Environmental Impact Statement, I assume it to mean the water surface profiles in the mains when the discharge is equal to the discharge occurring once in 5 years on the average. If this water surface is at the same elevation as the low spots in the fields, there would be no flooding from the 5 year runoff and the frequency of flooding with the project will be less than once every 5 years. If the statements that 0 acres will be flooded by the runoff of a 5-year-frequency storm are correct, then the Work Plan and the Environmental Impact Statement should be revised so that the reduction in the frequency of flooding is correctly stated.

7. The Environmental Impact Statement on page 31 states that the area flooded by a 100-year-frequency flood is 18,400 acres within the watershed and that the area flooded by the runoff from a 5-year-frequency storm is 18,200 acres. The Environmental Impact Statement on page 39 states that the acres flooded from the runoff from a 5-year-frequency storm will be reduced from 18,200 to 0 acres, presumably meaning that the acres flooded will be reduced to 0 acres for 18,200 acres. The same information is given on page 15 and 45 of the Work Plan. I cannot find any information in either document on the acreage that will be flooded by a 100-year-frequency flood with construction completed. This information should be given and the location of the lands that will be flooded by the 100-year-frequency flood shown on a map or by other means. It would be desirable, also, to give information on acreage that will be flooded after construction is complete with floods of 10-year-frequency, 25-year-frequency, and 50-year-frequency. This information is essential to present the development of false expectations that they will be protected from all floods on the part of owners or purchasers of lands that will be affected by floods of these frequencies, and is also essential for use by the persons who will determine the assessments to be paid by each tract of land.

8. On page 80 of the Work Plan there is a section on concrete chute spillway foundation investigations. This section states with respect to sites S-1, S-2 and S-3 that standard penetration tests were performed at each site and that these tests were supplemented by flight power auger borings. There is also a statement the site S-1 was moved. It is not clear whether the tests were at the site originally investigated, at the new site, or both. The section on foundation investigations also states that geologic information was extrapolated from site S-2 to the present location. The meaning is not clear, but the meaning seems to be applicable to the second site of structures S-1, and that no separate geologic investigation at the second site of structure S-1 was made. If it is true that no geologic investigation was made at site S-1, a geologic investigation should be made there. Site S-1 is at the downstream end of a large watershed, and failure of structure S-1 may result in serious erosion damage besides the damage to this expensive structure. The Work Plan should include information on possible alternatives to the construction of structure S-1 at the chosen site in the event that geologic investigation of the site and construction planning site investigations reveal conditions that make the site unsuitable. The Work Plan and the Environmental Impact Statement should include warnings that there has been no geologic investigation at site S-1, should state that such an investigation will be made as a part of the pre-construction engineering work, and should emphasize that a major alteration in structure location may be necessary if the geologic investigation shows that the site is unsuitable.

9. The Work Plan on page 25 states that the alternative of installing a single purpose floodwater retarding structure and channel work would reduce placement of snow in the channel from the snow removal operation on the roads. On page 47, the Work Plan states that snow that is removed from roadways will be on the berms and not in the channel. The same statement is on page 42 of the Environmental Impact Statements. The channels are mostly east-west channels on the south sides of east-west roads. Snowbanks on the berms resulting from road plowing will be on the north sides of channels. These snowbanks will in many instances act as snow fences and cause drifting of snow in the new channels. Although the enlargement of the channels and the increased distance from the roads to the channels will obviously reduce the construction of the channels resulting from snow deposition, the Work Plan and the Environmental Impact Statement should warn that the improved channels will be susceptible to obstruction by drifting snow to a greater or lesser degree.

10. The Work Plan on page 47 states that main No. 1 will reduce the land tributary to judicial ditch 53 by 4 square miles and will thus reduce floodwater volumes in the lower reaches, and the Environmental Impact Statement in item 13, page 45, says that reducing the contributing drainage area of the judicial ditch 53 system will be a favorable environmental effect of the project. There is no listing of the corollary adverse environmental effect on the flows in main No. 1 that results from this change. The Environmental Impact Statement should be revised on page 45 so that the list of adverse environmental

effects lists the increase in floodwater volumes in main No. 1 that will result from the addition of the 4 square miles of drainage area.

11. The Norman-Polk Watershed is in an area where natural divides between watersheds are poorly defined, where watercourses and drainage ditches in one watershed are interconnected with watercourses and drainage ditches in adjacent watersheds, where floodwaters flow across country from one watershed into adjacent watersheds and where highway embankments and other works cause diversions of water or act as watershed boundaries. This is also an area where watershed boundaries for flood flows may not be the same as low flow boundaries. Presumably the Norman-Polk Watershed had boundaries which are poorly defined and it is probable that there are places where under present conditions floodwaters from the watershed flow across the boundary into adjacent watersheds and places where floodwaters from adjacent watersheds flow into the Norman-Polk Watershed. There is no information in the Work Plan as to flows across the watershed boundary or as to the nature and characteristics of the present boundaries of the watershed. The Work Plan and the Environmental Impact Statement should be revised to provide information as to which reaches of the watershed boundary are so well defined that no inter-watershed flow occurs, as to the locations where inter-watershed flow into the watershed occurs, and as to the locations where inter-watershed flow out of the watershed occurs, and should provide information on the effects that construction of the project will have on inter-watershed flow.

12. The Addendum to the Work Plan states on page 4, item 12 that the Environmental Quality Plan includes installation of grade stabilization structures near the outlets of drainage ditches into the Red and Marsh Rivers. The water development project maps in the Work Plan and in the Environmental Impact Statement show a stabilization structure on the north line of section 13, township 146 north, range 49 west, where judicial ditch 54 discharges into the Marsh River. No stabilization structure discharging into the Marsh River is shown on the project maps in the Work Plan or the Environmental Impact Statement. On page 75 the Work Plan states that there was a request for improvements on judicial ditch 53 but that improvements could not be included in the structural measures described on page 28 and the following pages. According to page 75 the judicial ditch 53 improvements would have included a grade stabilization structure where judicial ditch 53 discharges into the Marsh River. If page 4 of the addendum to the Work Plan is correct and there is to be a grade stabilization constructed discharging into the Marsh River, the main body of the Work Plan, the Environmental Impact Statement, and the project maps and water development project maps should be revised to show where the structure is to be built and to show all facts concerning engineering studies, environmental effects, economic information, etc.

13. On page 75 the Work Plan states that surveys made of judicial ditch 54, county ditch 3 and county ditch 28, but that local people are improving the channels without federal assistance. These ditches are within the boundary of the Norman-Polk watershed. On page 29 the

Environmental Impact Statement says that local interests are improving these ditches. On page 12 the Work Plan has a section with the title "Soil, Water, and Plant Management Status" in which activities in the Norman-Polk Watershed are described. As noted in Comments 12, a stabilization structure is shown on the water development project maps in the Work Plan and in the Environmental Impact Statement at the north boundary of section 3, township 146 north, range 49 west, where judicial ditch 54 discharges into the Marsh River. This structure is not shown on the project maps. If this is an existing structure a note should be added to the water development project map showing that this is true. If the structure is a proposed structure to be built by other agencies, there should be a note showing this fact. If the structure is to be built as part of the Watershed Protection and Flood Prevention Project for the Norman-Polk watershed, it should also be shown on the project maps. According to the engineer's preliminary report to the Board of County Commissioners, Norman County, Improvement of Judicial Ditch 54, dated October 14, 1970, "the westerly one-half mile of ditch No. 54 was recently improved by widening and sloping and constructing an erosion control structure at the outlet into the Marsh River, which functions very well, and no work is contemplated on that part of the ditch." On sheet 4 of the profile which accompanies the engineer's detailed report on this project there is this note: "The ditch was improved from Sta 337+68 to the outlet in Marsh River, and an erosion control structure constructed at the Marsh River - in 1958 by U.S. SCS." If the engineer's report and plans are correct the note on the water development project maps showing that the stabilization structure is an existing structure should be expanded to show that the structure was built under the supervision of the Soil Conservation Service. The section in the Work Plan on page 12 with the title "Soil, Water and Plant Management Status" should be expanded to list among the activities of the cooperators with the Soil and Water Conservation Districts the construction of this structure and the improvement of the channel in the half mile upstream. Additional information should be given on the date of construction, the program under which construction was accomplished, and the effectiveness of the structure. Such information should also be given on page 75 of the Work Plan in the section on judicial ditch 54, county ditch 3 and county ditch 28.

B. Comments of the Division of Fish and Wildlife

1. Remaining wetlands recommended for public ownership include a large area north and adjacent to Agassiz II Wildlife Area (T.146, R.46, S.1, 9, 16, & 21 and T.147, R.46, S.28, & 33). Part of this area has already been proposed as a project.
2. The natural grasslands in T-147, R.45, S.32-33 are recommended for preservation or purchase. The Division of Fish and Wildlife already has a project (Agassiz II Wildlife Area) adjacent to the proposed PL 566 project area and is purchasing more land as it becomes available. The statement on page 50 of the EIS (paragraph 3) that lands in T. 147, R.45, S.32 & 33 were not recommended for purchase by the DNR, is reported by various Division of Fish and Wildlife personnel to be incorrect.

3. It should be indicated what kind of wildlife habitat will increase waterfowl, deer, grouse, etc.
4. This area cannot be considered a pheasant range.
5. There is a need to delineate present wildlife habitat and consider the losses as opposed to the gains.
6. One-row windbreaks are not beneficial to wildlife. More plantings of various trees and shrubs are needed.
7. The list of wildlife in the project area should also have included moose, deer, and sandhill cranes. Moose and deer are permanent residents in the watershed. Sandhill cranes are migrants which seasonally utilize the watershed.



UNIVERSITY OF MINNESOTA

Office of the Director
240 Coffey Hall
St. Paul, Minnesota 55101

October 29, 1974

Mr. Harry Major
State Conservationist
Soil Conservation Service
200 Federal Courts Building
316 Robert Street
St. Paul, Minnesota 55101

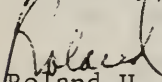
Dear Harry:

This is with respect to the work plan for the Norman-Polk Watershed which was sent to us several weeks ago for review. The response from three of my specialists reached me only today. Some questions that are being raised by several of the specialists are really for the purpose of perhaps providing for elaboration or clarifications on these questions in the work plan.

1. What attitudes have changed in the project area that will justify the presumption of greatly increased soil and water conservation practices?
2. What species of wildlife are expected to be benefited by and how will they be benefited by minimum tillage and crop residue management?
3. Will the construction firms employed for the project hire local people who are most likely unskilled in the operation of earth moving equipment, or will they employ skilled operators from elsewhere?
4. What are the plans for preparing ditch-side slopes for seeding? Here the specialists suggested that it probably would be important to incorporate a peat or straw mulch into the soil to achieve a stand of protective cover.
5. What is the fate of channels to be abandoned as a result of the project? Could some of these possibly be deepened and used for irrigation water supply and/or water fowl habitat?

These are just a few observations and I realize that they may be reaching you too late to be of significant value, but I am passing them on for what they are worth. It does not seem to me that any of them seriously question the project but rather are asked in the interest of clarifying the statement.

Sincerely,


Roland H. Abraham
Director

RHA/raa



MINNESOTA HISTORICAL SOCIETY

690 Cedar Street, St. Paul, Minnesota 55101 • 612-296-2747

10 September 1974

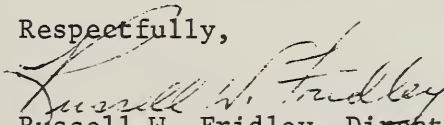
Mr. Harry M. Major, State Conservationist
United States Department of Agriculture
Soil Conservation Service
316 North Robert Street
Saint Paul, Minnesota 55101

Dear Mr. Major:

RE: Draft Environmental Impact Statement
Norman-Polk Watershed
Norman and Polk Counties, Minnesota

The Draft Environmental Impact Statement for the Norman-Polk Watershed project has been reviewed by the Survey and Planning and Archaeology sections of the Minnesota Historical Society as per your request of 16 August 1974. It is the finding of this review that there are no recorded properties of an archaeological or historical nature located within the project area or which would be directly affected through the implementation of the project as described in the August 1974 Statement. It is requested, however, that should the implementation of the construction phase of the watershed project lead to the discovery of archaeological materials, the Minnesota Historical Society be contacted immediately.

Respectfully,

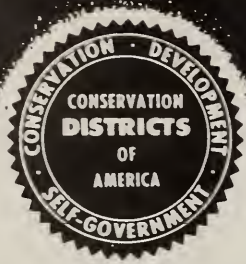

Russell W. Fridley, Director
Minnesota Historical Society and
State Historic Preservation Officer

cc: Dr. Elden Johnson, State Archaeologist
200 Ford Hall
University of Minnesota
Minneapolis, Minnesota 55455

Mr. Alan Woolworth, Chief Archaeologist
Minnesota Historical Society
Building 27, Fort Snelling
St. Paul, Minnesota 55111

Mr. Donn Coddington, Supervisor
Field Services, Historic Sites and Archaeology
Building 25, Fort Snelling
St. Paul, Minnesota 55111

RWF/fr



Minnesota ASSOCIATION OF SOIL & WATER CONSERVATION DISTRICTS

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LEONARD SKAAR
R.R. 1, Thief River Falls, Minn. 56701
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October 11, 1974

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President
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MRS. WALDEMAR GREWE
RR 2, Gibbon, Minn. 55335
Tel. 1-507-834-6680

Mr. Harry M. Major, State Conservationist
Soil Conservation Service
316 North Robert Street
St. Paul, Minnesota 55101

Dear Mr. Major:

I have reviewed the Draft Environmental Impact Statement of the Norman - Polk Watershed Project.

In the limited time I had, I believe the favorable environmental effects outweigh the adverse effects. In considering the alternatives, I believe the project very worth while and should be approved as presented.

Sincerely yours,

Leonard Skaar

Leonard Skaar
President MASWCD

Mr. Harry M. Major, State Conservationist
UNITED STATES DEPARTMENT OF AGRICULTURE
Soil Conservation Service
316 North Robert Street
St. Paul, Minnesota 55101


Dear Sir:

We would like to comment on the Work Plan and EIS for the Norman-Polk PL 566 Project located in Norman and Polk Counties, Minnesota.

Comments:

- (A.) Water will be entering an already overloaded river during spring runoff. Land located to the north along the Red River of the North will be exposed to a greater flood threat during peak runoff years.
- (B.) Drainage ditches in the past have provided very poor habitat for wildlife. After reading this report, It appears that wildlife will again be the losers if this project is allowed to proceed.
- (C.) Seemingly as a result of this ditch more land owners will be encouraged to drain the few remaining marsh lands that still exist. Wet prairies will also be in danger as drainage becomes more feasible.
All lands currently not being farmed or unsuitable for cropland should be put into public ownership and converted to natural grasslands for Wildlife use.
- (D.) Lake Agassiz beachlines should not be cut through by ditches. These areas still contain large tracts of native grasslands which currently provide habitat for many species of Wildlife such as the endangered Prairie Chicken.
- (E.) Past Conservation techniques such as Pits and Ponds have been of little value to Waterfowl.

Sincerely,



Gladwin A. Lynne, Pres.
Agassiz Audubon Society
523 No. Montana St.
Warren, Minnesota 56762

cc: Ed Brigham III

Appendix C - Bridge, Culvert, and Road Modification

Norman-Polk Watershed, Minnesota

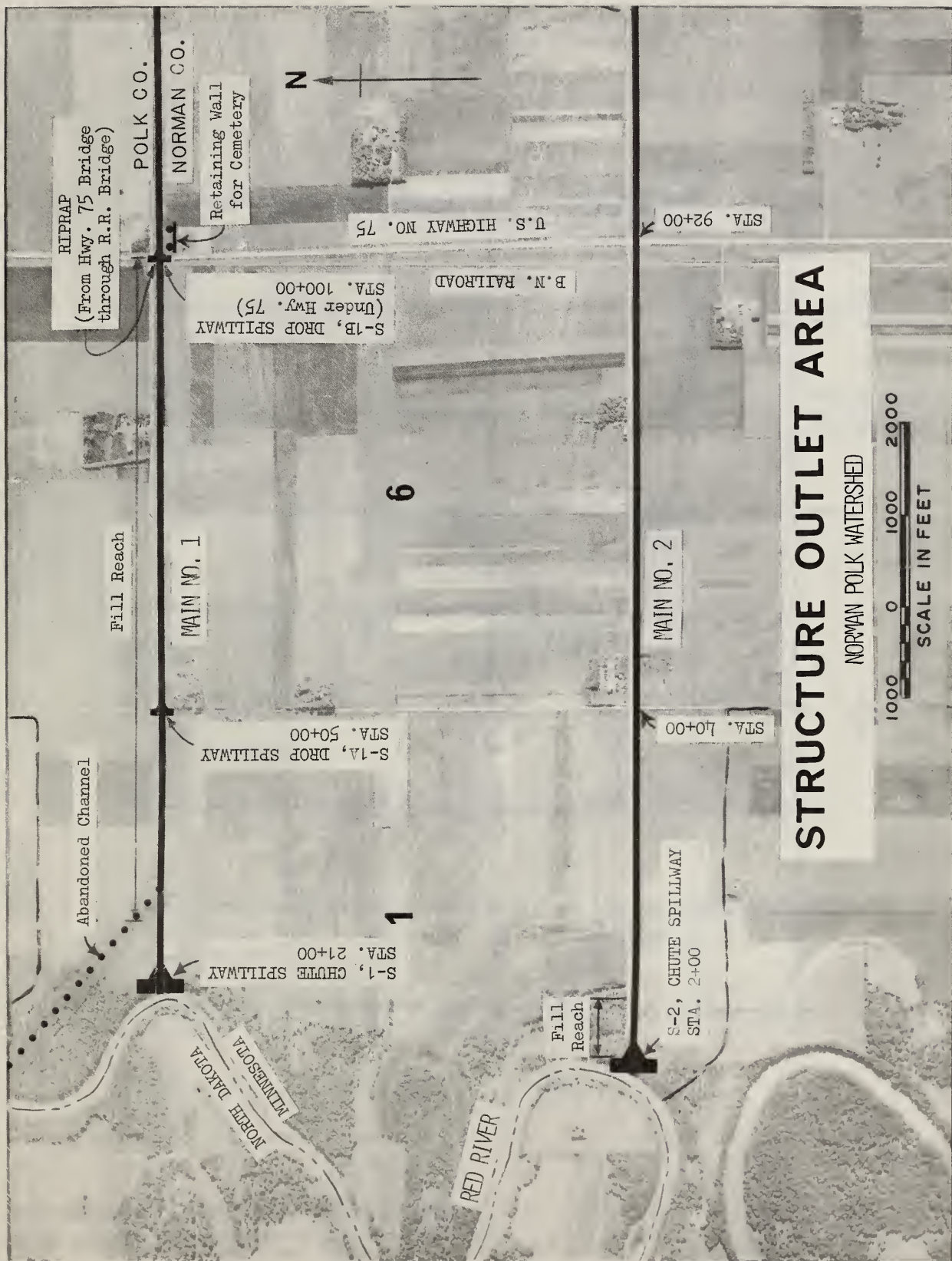
Channel	Station	Location	Effect	Roads Affected
Main No. 1	50+06	Sec. Cor. 36, 31, 1 & 6, T147/146N, R/49/48W	Install Box Inlet Drop Spillway w/Road Crossing (Old Bridge Washed Out) (Grade Stab. Str. S-1A)	
	99+65	BN-RR Trestle Sec. 6, T146N, R42W	Riprap	
	100+35	U.S. Highway 75 - Sec. 31, 32, 5 & 6, T147/146N, R48W	Install 2.0 Weir (Grade Stab. Str. S-1B)	
	153+09	Sec. 32, 33, 4 & 5, T147/146N, R48W	Repair	
	204+86	Sec. 33, 34, 3 & 4, T147/146N, R48W	Remove (Bridge)	Township Road
	259+20	Sec. 34 & 35, 2, 3, T147/146N, R48W	Satisfactory	
	312+08	Sec. 35 7 36, 2, 1, T147/146N, R48W	Satisfactory	
	364+07	Sec. 36, 31, 1 & 6, T147/146N, R48/47W	Remove (Bridge)	Township Road
	415+88	Sec. 31, 32 5 & 6, T147/146N, R47W	Remove (Bridge)	Township Road
	470+80	Sec. 32, 33, 4 & 5, T147/146N, R47W	Replace Bridge	
	522+74	Sec. 33, 34, 3 & 4, T147/146N, R47W	Remove (Bridge)	Field Crossing

Appendix C - Continued

Channel	Station	Location	Effect	Roads Affected
Main No. 1	572+54	Sec. 34, 35, 2 & 3, T147/146N, R47W	Replace Bridge	
	628+91	Sec. 35 & 36, 1, 2, T147/146, R47W	Remove (Culvert)	Township Road
	681+81	Sec. 36, 31, 1 & 6, T147/146N, R47/46W	Remove (Bridge)	Township Road
	786+73	BN-RW, Sec. 32, 5, T146/147N, R46W	Satisfactory	
	788+24	FAS No. 9, Sec. 32, 33, 4, 5, T146/146N, R46W	Satisfactory	
Branch 1	840+22	Sec. 33, 34, 3, 4, T147/146N, R46W	Satisfactory	
	52+23	Sec. 1, 6, 7, & 12, T146N, R47/48W	Replace Bridge	
	104+59	Sec. 12, 13, 7 & 18, T146N, R47/48W	Replace Bridge	
	0+30	Sec. 6, T146N, R47/46W	Remove (Culvert)	Field Crossing
Branch 1	52+58	Sec. 1, 12, 6 & 7, T146N, R47/46W	Replace Bridge	
	108+45	Sec. 7, 18, T146N, R46W	Install Culvert	
	161+24	Sec. 7, 8, 17 & 18, T146N, R46W	Replace (w/Culvert)	
	199+47	Sec. 17, 18 (CN-RR) T146N, R46W	Replace (w/Culvert)	
	214+20	Sec. 8, 9, 16 & 17, T146N, R46W	Install Box Inlet & Culvert (Grade Stab. Str. S-1b)	

Appendix C - Continued

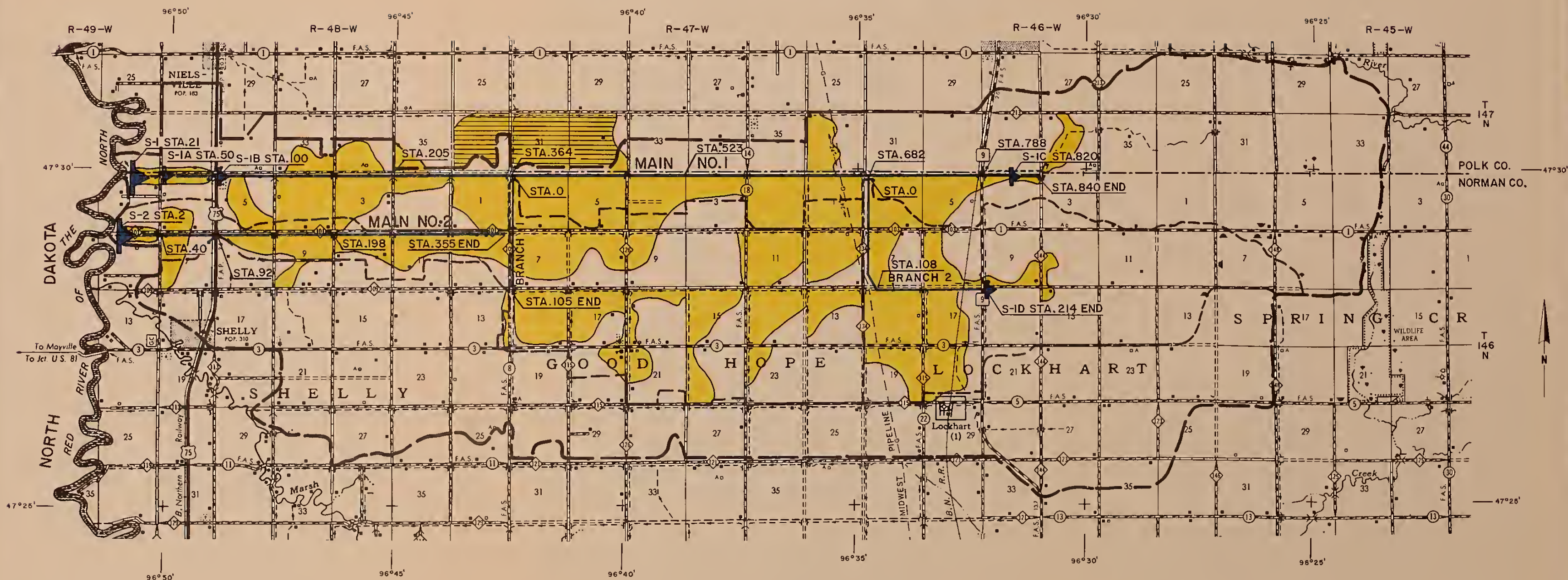
Channel	Station	Location	Effect	Roads Affected
Main No. 2	5+44	Farm Drive - Sec. 12, T146N, R49W	Replace Culvert	
	40+46	Sec. 1, 6, 7, & 12, T146N, R49/48W	Replace Culvert	
	44+38	Sec. 6, T146N, R48W	Remove (Culvert)	Field Crossing
	89+01	BN-RR Trestle, Sec. 7, T146N, R48W	Satisfactory	
	91+83	U.S. Hwy. 75, Sec. 5, 6, 7, 8, T146N, R48W	Satisfactory	
	144+29	Sec. 4, 5, 8, & 9, T146N, R48W	Replace Culvert	
	171+21	Field drive - Sec. 4, T146N, R48W	Replace Culvert	
	197+59	Sec. 3, 4, 9 & 10, T146N, R48W	Replace Culvert	
	250+22	Sec. 2, 3, 10, & 11, T146N, R48W	Replace Culvert	
	302+63	Sec. 1, 2, 11, & 12, T146N, R48W	Satisfactory	
	324+79	Farm Drive - Sec. 12, T146N, R48W	Remove	Field Crossing
	335+31	Farm Drive - Sec. 12, T146N, R48W	Remove	Field Crossing



PROJECT MAP

NORMAN-POLK WATERSHED

NORMAN AND POLK COUNTIES, MINNESOTA

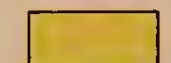


LEGEND

WATERSHED BOUNDARY
SUBWATERSHED BOUNDARY

AREA BENEFITED

COMMON FLOOD PLAIN BENEFITED



GRADE STABILIZATION STRUCTURE
(CHUTE SPILLWAY)

GRADE STABILIZATION STRUCTURE
(DROP SPILLWAY)

CHANNEL IMPROVEMENT



SCALE 0 1 2 3 MILES
SCALE 1/100,000

SOURCE:
COUNTY HIGHWAY MAPS AND DATA
FURNISHED BY FIELD TECHNICIANS

(POLYCONIC PROJECTION)

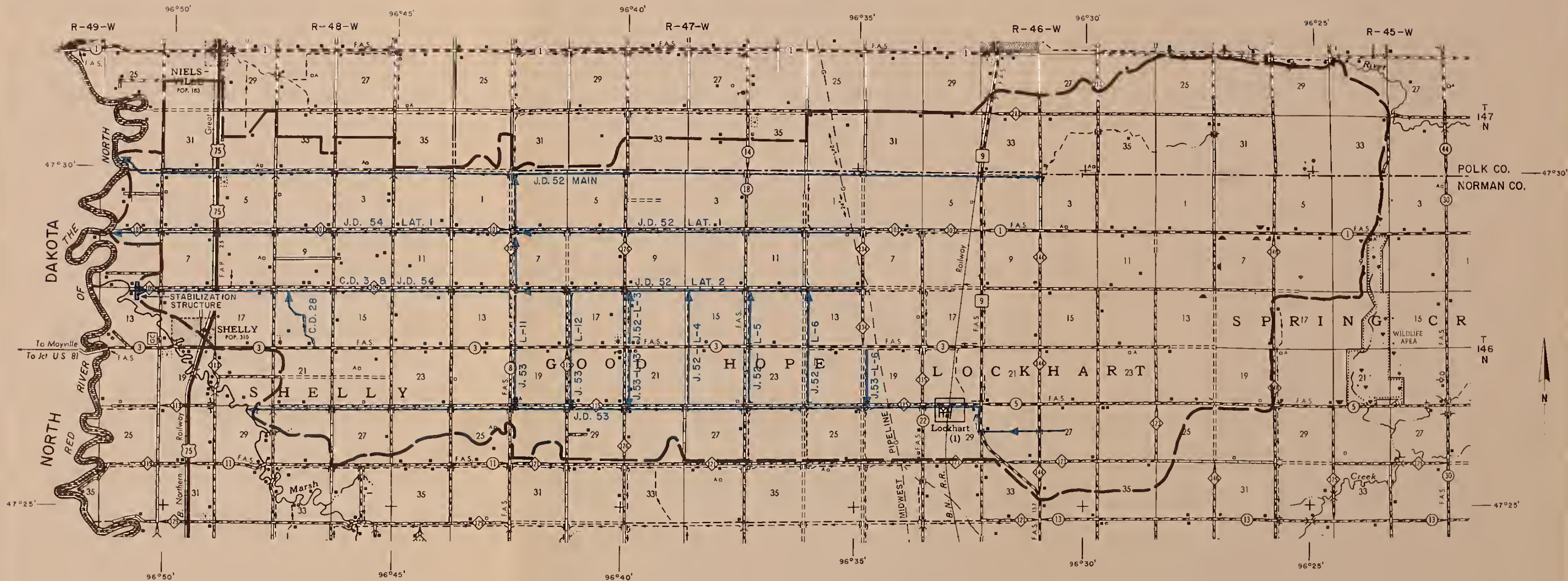
APPENDIX E

11-8-71
5,P-29,644

WATER DEVELOPMENT PROJECT MAP

NORMAN-POLK WATERSHED

NORMAN AND POLK COUNTIES, MINNESOTA



SOURCE:
COUNTY HIGHWAY MAPS AND DATA
FURNISHED BY FIELD TECHNICIANS

(POLYCONIC PROJECTION)



SCALE 1 0 1 2 3 MILES

SCALE 1/100,000

APPENDIX F

11-8-71
5,P-29,645

APPENDIX G

Glossary of Terms

average annual acres - A weighted value for the acres flooded from all flood events over a period of time. This includes the flooded acreage resulting from large infrequent floods to the small frequent events.

beach ridges - Sand and gravel beach shorelines formed as a result of the Glacial Lake Agassiz.

berm - An unaltered area of land between the edge of the improved channel and the excavated spoil.

channel work - The improvement of the flow characteristics of a channel by clearing, excavation, or other means to increase its capacity.

chute spillway - A high velocity, open channel for conveying water to a lower level without erosion.

conservation plans - The recorded decisions of the cooperating land user on how he plans, within practical limits, to use his land in an operating unit within its capability and to treat it according to its needs for maintenance or improvement of soil, water, and plant resources.

conservation practices - The measures that are applied to land that will reduce wind and water erosion and that will protect and improve the natural resources.

discharge - Rate of flow, specifically fluid flow; a volume of fluid passing a point per unit time, commonly expressed as cubic feet per second.

drainage - The removal of excess surface water from land by means of surface drains.

drop box to culvert - A rectangular box attached to the upstream end of a culvert that allows for the movement of water to a lower elevation.

ephemeral flow - Flows during periods of surface runoff only - otherwise dry.

evaluation period - The period of time used in determination of benefits and cost used for benefit-cost analysis.

fallow - Allowing cropland to lie idle, either tilled or untilled, during the whole or greater portion of the growing season.

five-year frequency flood - A flood of such magnitude that will be equaled or exceeded on an average of once in a five-year period.

flood plain - Nearly level land situated on either side of a channel which is subject to overflow flooding.

flood prevention - An undertaking for the purpose of reducing or preventing all forms of damage from inundation of property, disruption of business and other activity, hazards to health and security, and loss of life, and increase in the net return from higher use of property made possible as a result of lowering the flood hazard.

floodway - A channel, either natural, excavated, or bounded by dikes and levees, used to carry excessive flood flows to reduce flooding. Sometimes considered to be the transitional area between the active channel and the flood plain.

Glacial Lake Agassiz - A large prehistoric lake that formed and disappeared during the last continental glaciation, about 10,000 years ago. The lake covered the entire Red River Valley and extended into Canada.

grade stabilization structure - A structure which allows water to fall to a lower elevation and controls the erosion in a natural or artificial channel.

indirect damages - The damages of certain losses that occur as a result of floodwaters, even though they are not caused by the floodwaters themselves.

intermittent flow - Continuous flow through some seasons of the year but little or no flow through other seasons.

judicial and county ditches - A legal ditch that was established in accordance with Minnesota Statutes, Chapter 106.

lake plain - The flat land that was at one time the lake bottom of Glacial Lake Agassiz.

land adequately treated - Land that is used within its capability on which the needed conservation practices that are essential to its protection and planned improvements have been applied.

land capability class - Reflects the problem or hazards of the individual soils. Soils in class II have some limitations that reduce the choice of plants or require moderate conservation practices. Soils in class III have severe limitations that reduce the choice of plants or require special conservation practices or both.

land rights - The cost associated with acquiring land, easements, leases, and rights-of-way. Included in these costs are the associated engineering and administrative services. The cost of all road and bridge modification are considered as land rights.

micro-relief - Minor differences in surface configuration and/or small depressional areas in the land surface of the lake plain.

N,P,&K - Nitrogen, Phosphorus, and Potassium.

one hundred-year frequency flood - A flood of such magnitude that will be equaled or exceeded on an average of once in a one hundred-year period.

parts per million - A term expressing the concentration, either dissolved or undissolved material, in a number of units (by weight) within a million units.

perennial flow - Flows at all times except during extreme drought.

pipe inlet - A pipe or conduit in an embankment to lower the water to a lower elevation.

project installation period - The period of time that is necessary to install all the planned land treatment and structural measures.

side slope - The slope on the side of the channel. It is customary to name the horizontal distance first, as 4 to 1 or 4:1, meaning a horizontal distance of 4 feet to 1 vertical.

soil loss tolerance - The maximum average annual soil loss in tons per acre per year that should be permitted on a given soil.

spoil bank - A pile of soil, subsoil, rock, or other material excavated from a drainage ditch, pond, or other cut.

straight drop spillway - Overfall structure in which the water drops over a vertical wall onto an apron at a lower elevation.

straight drop spillway and box culvert - Overfall structure in which the water drops over a vertical wall onto an apron at a lower elevation and flows into a culvert.

streambank erosion - The eroding away of natural materials on a streambank and bottom of a natural or modified channel.

tilth - The physical condition of soil as related to its ease of tillage, fitness as a seedbed, and impedance to seedling emergence and root penetration.

type I wetland - A type I wetland is a seasonably flooded basin or flat. The soil is covered with water or is waterlogged during variable seasonal periods, but is usually well drained during much of the growing season. Most of this land is in cropland production.

type II wetland - A type II wetland is an inland fresh meadow. The soil usually is without standing water during most of the growing season, but is waterlogged within at least a few inches of its surface. Most of this land is in cropland production.

type III wetland - A type III wetland is an inland shallow fresh marsh. The soil is usually waterlogged during the growing season; often it is covered with as much as 6 inches or more of water. Vegetation includes grasses, bulrushes, spike rushes, and various other marsh plants such as cattails, arrowheads, pickerelweed, and smartweeds.

watershed protection - An undertaking for the purpose of providing proper land use and the application of needed conservation practices for the protection of soil loss from wind and water erosion and the improvement of the soil and water resources.

